

**10th International Conference
Of
UNESCO Global Geoparks**

4 - 11 September 2023

Marrakesh - M'Goun Global Geopark Unesco

ABSTRACTS BOOK

PAGE	List of first authors in alphabetical order	PAGE	List of first authors in alphabetical order
2	Abdul Halim Sharina	51	Biswas Anil Kumar
3	Abelaez Juan Pablo	52	bloise luigi
4	Adisubroto Umar	53	Bourli Nicolina
5	Adjobi Paul-Andre	54	Boutakiout M. - Achbal D.
6	Affandi Mokhtar	55	Bouzekraoui Hicham
7	Agus	56	Boyle Michelle
8	Ait Oumchich Kamal	57	Br†steinand Espen
9	Ajayebi Kimiya Sadat	58	Brake Sacha
10	AL HARRAS MERIYAME	59	Brown Theodore
11	Aldosari Ali	60	Budiman Dana
12	Alejandra G. Guti,rrez-Alejandro	61	Bukhariand Azmil
13	Alexandru Andra	62	Burkhardt Heike 1
14	Alves Joao	63	Burkhardt Heike 2
15	Amaguar Fatima	64	Butel Emily
16	ANG Meliawati	65	BuxKhosol Rasool
17	Angeliki Pritenzi Maria	66	Calabrese Egidio 1
18	Ansori Chusni	67	Calabrese Egidio 2
19	AOYAMA Atsushi	68	Calder John
20	Ardislamov Faniz	69	Canet Carles
21	Arianna Nigeri	70	Casillas Ruiz Ramon
22	AYTAC Ahmet Serdar	71	Castro Emanuel de
23	Azman Norzaini	72	Chan Yu Nam
24	Azmil Munif Mohd Bukhari	73	CHATTOU Zoubir
25	Azrul Shah Mohamad	74	CHEN Runze
26	Bàch Vân Trần Nhị	75	choi cindy
27	Bajec Rupnik Urska	76	Chokkhun Suphunnee
28	Bajraktari Fadil	77	Chulepin Helga 1
29	Ballesteros Daniel	78	Chulepin Helga 2
30	BAO Jihong 1	79	Chulepin, Helga 3
31	BAO Jihong 2	80	Cortijo, I
32	baraas Abdillah	81	Costa Ferran Climent
33	Barrakad Imad	82	Costa Soraia
34	Barrera, J.M.	83	Cruz-Perez Miguel A.
35	Barriuso Leire	84	Cust†dio Salom, C.
36	Bartelletti Antonio	85	Cychowska-Nowak Monika 1
37	Bastos Susana	86	Cychowska-Nowak Monika 2
38	Batsi Anna	87	Da Prato Simone
39	Bechtel Arthur Philippe	88	Da Silva Marinho Thiago 1
40	Bellini Filippo 1	89	Da Silva Marinho Thiago 2
41	Bellini Filippo 2	90	De Luca Violetta
42	Ben Hassine Mohsen	91	Deenisa Rochadji and alii
43	Benhsain Wafaa	92	DELABY Serge
44	Benlakhdim mohamed	93	Deo Immanuel
45	Benlasri Mokhtar	94	Aguirre-Díaz, G.J.
46	Bensi Sara	95	Dietrich Katharina
47	Bergengren Anna	96	Dilari Vera
48	BERRED Sanae	97	Din Karl Michael
49	Bidondo Eugenio	98	Do Thi Yen Ngoc
50	Biot Vincent	99	Don Hoang Xuan
		100	dos Santos Costa Silas Samuel 1

PAGE	List of first authors in alphabetical order	PAGE	List of first authors in alphabetical order
101	dos Santos Costa Silas Samuel 2	151	Gulas-Woehri Oliver2
102	Duangkrayom Jaroon	152	Gumus Erdal
103	Duong Thi Hieu	153	Guo Jianeng
104	ECH-CHARAY Kawtar	154	GUTI RREZ Gustavo
105	Efe Recep	155	Hélou-Frugier Floriane
106	Einarsson Daniel	156	Haiyang Ding
107	El Baki yousra	157	Hakkarainen Veera
108	El KHalki yahia 1	158	Han Daik
109	El Khalki Yahia 2	159	Haraha Misbahib
110	Elena Storta	160	Hartmann Gerald
111	Eridani Selene	161	He Qingcheng
112	Etourki Hassan	162	Heikki Mäkipää
113	Eugenio Bidondo	163	Heinz liza
114	Eugenio Erika Lima de Melo	164	Hermansson Terttu
115	Fabjan Edi	165	Herrera Patricia
116	Fan Lin	166	Hilario Asier
117	Fan Zhang	167	Hoffmann Gosta
118	Fang CHEN	168	Huang He Qing
119	Farias, Cristian	169	HUANG Tao
120	FASSOULAS Charalampos 1	170	Huang Wen
121	FASSOULAS Charalampos 2	171	Huh Min
122	Fello Nuri Mohamed	172	Hultman Sofia
123	Ferreira Flavi L.F 2	173	Huong Pham,
124	Ferreira Flavi L F 1	174	laikarova Alia
125	Ferreira Jorge 1	175	Ide Akira
126	Ferreira Jorge 2	176	IIDA YOSHIHIKO
127	Fiestiandani Ipuk	177	Imperatori Fabjola M.
128	Fischer Tobias	178	Indra Amalla Rainita
129	Frey Maria-Luise	179	Irfan Dedy 1
130	Fukumura Seiya	180	Irfan Dedy 2
131	Garcja Jim,nez Antonio 1	181	Jaapar Abd Rasid
132	Garcja Jim,nez Antonio 2	182	James Patrick
133	Garcia L. F. 1	183	Jasim Anwar
134	Garcia L. F. 2	184	Javier Lopez
135	Garcia L. F. 3	185	Jaya Asri
136	Gardoň Luboš	186	Jikey Ndo
137	Gengyu Li	187	Jimenez Antonio Garcia
138	Gentilini Sara 2	188	Jingang Wu
139	Gentilini Sara 1	189	Jintasakul Pratueng
140	Gianoglio Fedra	190	JKim ung-hoon
141	GLEESON Carol	191	João Patrícia
142	Goran Radonic	192	José Ángel S. Fabian 1
143	Grant Caleb	193	José Ángel S. Fabian 2
144	GRAVAT HODAN Shona	194	Jung Jongyun et al.,
145	Groeger Martin	195	Jung Jongyun 1
146	Guerini Michele	196	Justice Sophie
147	GUIMARÇES E.S .1	197	Juying Meng
148	GUIMARÇES E.S. 2	198	Kakizaki Yoshihiro
149	GUIMARÇES E.S. 3	199	Kamil Amir
150	Gulas-Woehri Oliver 1	200	Kampolis Isidoros 1

PAGE	List of first authors in alphabetical order	PAGE	List of first authors in alphabetical order
201	Kampolis Isidoros 2	251	Lingling Wang
202	Kaneta Koki	252	Lippolis Elio 1
203	Kardatou Fani	253	Lippolis Elio 2
204	Karine Ana	254	Loureiro Fajbio
205	Karmakar Abhisek	255	Löwen Kersten
206	Katori Takuma	256	Lu Chunyu
207	Kavcic Mojca Gorjup	257	Lu Qinfei
208	Kazamia evi	258	Luciano Di Martino
209	Kejian Xu	259	Mahbubi Ahmad
210	Khaldoune Fatima	260	Mäkipää Heikki 1
211	Khamcha Chanchana	261	Mäkipää Heikki 2
212	khardali ismail	262	Mäkipää Heikki 3
213	Khasanova A.I.	263	Mampel L
214	Khoso Rasool Bux	264	Marquez-Rosado, L.B1
215	KIM HoGeun	265	Martina Pásková
216	Kim Jung-hoon	266	Martinez Jose A.
217	Kiuttu Mikko	267	Massias Melanie
218	KOHMOTO Daichi	268	Matheus Lisboa Nobre da Silva
219	Koivumäki Laura	269	May Susan
220	Koki Kaneta	270	Mc Glinchey Mauriri
221	KOLYA Andr, de Andrade	271	Megerle Heidi Elisabeth 1
222	Komoo Ibrahim	272	MegerleHeidi Elisabeth 2
223	Konstantina Bentana 1	273	Megyeri Balázs
224	Konstantina Bentana 2	274	Mendonca Jeanne Francisca
225	Konstantina Bentana 3	275	Meneses Salome
226	KORB LY Barnab s	276	Michael Din
227	Kottabi Salah Eddine 1	277	Michailidou Irene
228	Kottabi Salah Eddine 2	278	Miyeon Yoo
229	Kottabi Salah Eddine 3	279	Mohamad Dwi Sapari Hadian
230	Koumoutsou Eleni	280	Momene Tuwa Brigitte
231	Kruainok Parichat	281	Morais Antónia Maria 1
232	Kumar Biswas Anil	282	Morais Antónia Maria 2
233	Kummer Sabine	283	Moraiti Evgenia
234	Kunthasap Passkorn	284	Morimoto Taku
235	Laitila Annie 1	285	Nagata Koki 1
236	Laitila Annie 2	286	Nagata Koki 2
237	Lanery	287	Nagata Koki 3
238	Lansigu christophe	288	Nait Ouacha and Souhel
239	LAOUINA Abdellah	289	Nakada Setsuya 2
240	Lee Aejin	290	Nakada Setsuya 1
241	LEE Seungyeon	291	Nakamura Akifumi
242	Lee Yun-su	292	Nakase Hiroshi
243	LEGAL Stephane 1	293	Naomi Foster
244	LEGAL Stephane 2	294	Nedvěďická Blanka
245	Lemon Kirstin	295	Negri Arianna
246	Li Gengyu	296	Nenonen Jari
247	LI Yue	297	Neto Keynesmenio
248	Liang Shi	298	Neto Miguel de Castro
249	Lima Eva	299	Ngoc Thi Yen
250	Lin Wensheng	300	Nhị Bạch Vân Trần

PAGE	List of first authors in alphabetical order	PAGE	List of first authors in alphabetical order
301	Ningzhang Chen	351	Rocha Daniela
302	Nomikou Paraskevi	352	Rocha Daniela 2
303	Norhaya Ahmad	353	Rocha Daniela 3
304	Nowak Monika 1	354	Rodrigues Joana 2
305	Nowak Monika 2	355	Rodrigues Joana 1
306	Nunes João Carlos	356	Rodrigues Joana 3
307	Nyulas Judith	357	Roelfs Gretha
308	Obara Hokuto	358	Rolfe Rebecca 1
309	O'Connor, Gráinne 1	359	Rolfe Rebecca 2
310	O'Connor, Gráinne 2	360	Rollier Brigitte
311	O'Farrell Seán	361	RONG Miao
312	O'Grady Michelle	362	Roque-Melas Sophia
313	Ohno Marekazu	363	Rosado-González Emmaline
314	Oña Lisbeth	364	Rosana Mega Fatimah
315	Osada Mutsuki	365	Rule Roy
316	Papadopoulou Penelope 2	366	Ruschkowski Eick von
317	Papadopoulou Penelope	367	Sahli Fatima Zahra
318	Pardede Togu	368	SAKAMOTO Takaaki
319	Paskova Martina	369	Salom, Meneses
320	Paulo Dajlia	370	Salu Antony Thierry de Oliveira
321	Paz Alexandra	371	Samuel dos Santos Costa Silas
322	Paz Alexandra (2)	372	Samuel dos Santos Costa Silas ,
323	Pellicer Mir	373	Sanchez José, angel Fabian
324	Perakis Vangelis	374	Sanchez-Arredondo 2
325	Pereira Bruno Claro 1	375	Sanchez-Arredondo 1
326	Pereira Bruno Claro 2	376	Sanchez-Cortez Jos, Luis 1
327	Pereira Bruno Claro 3	377	Sanchez-Cortez Jos, Luis1 2
328	Petit Alain	378	Sanudo Pulgar.docx
329	Pimentel Nuno 2	379	sas abdillah
330	Pimentel Nuno 1	380	Sauer Nancy
331	Poros Michal	381	Sayedyounesi Soma
332	Pranita Diaz	382	Schmalzl Lilia .
333	Pratchayakup Phakasawan	383	Schmidt Lana
334	Prelec Filip	384	Schuller Andreas
335	Pritenzi Maria Angelika	385	Seghedi Antoneta
336	Probonas Michalis	386	Sell Jaciele 1
337	Ptochoulis Panagiotis	387	Sell Jaciele 1
338	Puras Guillem	388	Sell Jaciele 2
339	Putri Inasritaty	389	Sell Jaciele 3
340	Qiang (Jason) Li	390	Sen Yang
341	Qingzi Ye	391	Sengthongnalin Khamheng 2
342	Qiong Chen	392	Sengthongnalin Khamheng 1
343	Ramos Dulcinea	393	Seong Joo
344	Razak Januarani 1	394	Septiana Ana R
345	Razak Januarani 2	395	Sheibani Vesal Yahya
346	Razak Januarani 3	396	Shiba Hikari
347	Recep Efe & Soykan	397	Shires Claire
348	Ren Fang	398	Sigursveinsson Sigurður
349	Ren Fang 2	399	Silva Miguel Reis 1
350	Ristovsk Igor	400	Silva Miguel Reis 2

PAGE	List of first authors in alphabetical order	PAGE	List of first authors in alphabetical order
401	Singhwachiraworakul Pakkaporn	432	WANG Junbo
402	Sitdikov A.R	433	Wannapa Somta
403	Socratis Tsacos	434	Wansang Ryu
404	Storta Elena	435	Watanabe Yusuke
405	Stupar Martina	436	Weber Jutta
406	SUN Wenyan	437	Weissheimer de Borba Andr,
407	Tadoumamt Boujemaa	438	Wibowo Tri
408	Tallgren Vilma-Lotta	439	Wilkinson Malcolm
409	Talvitie Pasi	440	Williams Mark
410	Tantaatipanit Saengpet	441	Wilson Joanna and Wakita Koji
411	Taylor Greg	442	Wilson Joanna
412	Taylor Greg 2	443	Woloszyn Jagoda
413	Thjømøe Pål	444	Xiaoyuan Zhang
414	Thongdee Nattinee	445	Xu Kejian
415	Thu Thuy Ly Thi	446	YAN Luobin
416	Thùy, Vi Trần	447	Yang Lichao
417	Torres Peaquive Patricia	448	Yao Meng
418	Torrescusa Vega	449	Young Ng
419	TSUJI Shyuji	450	Young Ng 2
420	Tuncer Demir Ahmet	451	Yue Li
421	Unjah Tanot	452	Yusmadi Andrie
422	Utama Hari Wiki 2	453	Zahdi Ricetti JoÆo Henrique
423	Utama Hari Wiki	454	Zaini Mohamad Farid
424	Valiakos Ilias	455	ZHANG Linping
425	van de Koppel Johan	456	Zhanqian Lu
426	Vautrin Quentin	457	ZHAO Yueming
427	Vaz N.M.	458	Zhou Jianmin
428	Verdeny Esteve NÉria	459	Znari Mohammed
429	Verpaelst Pierre.docx	460	Zoumpouli Elena
430	Vidakis Nikolaos	461	Zouros Nikolaos
431	Wada Kaori		

CONSERVATION IS DEVELOPMENT' IN GOMBAK-HULU LANGAT GEOPARK, MALAYSIA: SUSTAINING NATURE AND CULTURE HERITAGE FOR POSTERITY

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Converting heritage is significant because it reflects and builds local community identities, assists in promoting sustainability and provides a sense of place. In Malaysia, there are conservation sites that are recognized under UNESCO World Heritage Sites, Man and Biosphere Reserves, and Global Geoparks. The interactions between humans and their natural environment underlie cultural heritage with aesthetic, unique, and outstanding universal values (OUVs). As such, there has to be conscious efforts made to protect and conserve these heritage resources, so as to ensure their sustainability for generations to come. The link between natural and cultural heritage is intricate and intertwined, often transcends the object or subject of conservation. Thus, taking into account the need to balance multiple needs and demands of development is crucial, particularly the risks or threats that may lead to its loss or destruction. Gombak-Hulu Langat Geopark, the eight national geopark in November 2022, is situated in a rapid urban setting of Selangor. The challenge to ensure sustainability amidst all planned development is imperative as the state of Selangor continues to face rising cases of environmental issues, related to water resources, natural hazards, and anthropogenic disturbance. Hence, 'conservation is development' in Gombak-Hulu Langat Geopark was highlighted in reigniting the aspiration of development that meets present needs without compromising future generations. Geopark is an innovative tool that strives for sustainability in integrated heritage conservation, lifelong education, and local socio-economic development. In this paper, we will discuss the process and justification involved to develop urban geopark in Gombak-Hulu Langat districts in Selangor. As a national geopark, the next step is getting ready to apply to be a member of the UNESCO Global Geopark accreditation. Shifting the mindset and raising awareness of all stakeholders to embrace 'conservation is development' is an ongoing initiative in getting local community and relevant authorities' support and action. The success of a Gombak-Hulu Langat Geopark not only will make this city a better place to live but also add on to examples in the world where conservation and human development is no longer an either or proposition, and that there's still hope.

VOLCAN DEL RUIZ GEOPARK PROJECT - COLOMBIA

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The Volcan del Ruiz Geopark Project is made up of 4 departments (Caldas, Quindío, Risaralda and Tolima) and 20 municipalities that gather 715,000 people in our territory. Its governance is in the EJE CAFETERO RAP, a supra-departmental entity that registered the Geopark project as one of the most important within its Regional Strategic Plan. It was born in 2015 thanks to the initiative of the Colombian Geological Service, National Parks of Colombia and the Government of Caldas. Since then and with the support of more than 130 actors and joint management with the communities, the Geopark has been established as a territorial strategy that makes things happen. One of the most outstanding exercises that have been carried out is the "Volcan del Ruiz Geopark Youth Club", which is made up of young volunteers between the ages of 14 and 35 belonging to different youth groups such as the "National Youth Network of Environment" throughout different municipalities in the territory, which are interested in working around the pillars of the Geopark. With this group of young people, we seek to continue promoting the Geopark message and, in particular, knowledge of the geo-territory and the need to preserve it, because no one can take care of what they do not know. In November 2022 we had our first meeting of "Youth Geopark" in Caldas, with the participation of 60 young people in the framework of the Meeting on Geo-conservation and Climate Change. The Geopark Youth Club is a geo-education program that was born as an initiative to strengthen the interdisciplinary education of young people in the communities that are part of the Geo-routes of Volcanic Resilience and Climate Change, in the departments of Tolima and Caldas, focused on the municipalities of Villamaria, Manizales, Herveo, Murillo, Libano and Armero; providing them with conceptual and practical tools that reinforce their personal values and principles, broaden their knowledge, improve their professional skills and strengthen the Andean identity of our territory, developing in parallel the social appropriation of knowledge related to volcanic risk management. This program is configured from the need to make visible a forgotten identity in our territory: the Andean identity. Therefore, it is important that, from environmental and cultural education, we work with our youth communities through an interdisciplinary proposal designed from modules that include territorial interpretation, project management, and sustainable entrepreneurship, under a focus that highlights the cultural, geological, and natural diversity of our territory. One of the geosites of international relevance is the Nevado del Ruiz Volcano (which is part of the Geo-route of Resilience), due to the Armero tragedy, which occurred in November 1985. From this event, the studies carried out by the Service Colombian Geological System (SGC) have allowed institutions empowered to manage risk to establish mechanisms and tools aimed at mitigating the harmful consequences of these natural events. Despite the advances, there is general ignorance on the part of the communities in relation to the possible latent risks in the territories. That is why the Volcan del Ruiz Geopark Project launches this program in order to broaden the knowledge of the territory, the present risks, and their mitigation linked to the geo-routes by the community, through the empowerment of its youth and future managers.

LOCAL SOCIO-ECONOMIC CONTRIBUTIONS THROUGH GEOPARKS DEVELOPMENT ON UNESCO GLOBAL GEOPARK AREAS IN INDONESIA

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The development of geoparks in Indonesia has been progressing rapidly in the last several years, as shown by the increasing number of UNESCO Global Geoparks (UGG), National Geoparks, and Aspiring Geoparks within the archipelago. To support Geopark activities, as a regulatory framework, the President of the Republic of Indonesia has issued Presidential Regulation No. 9 of 2019. As its derivation, the Minister of National Development Planning/Head of the Ministry of National Development Planning issued the Minister Regulation No. 15 of 2020 on Indonesia's Geoparks Development Action Plan 2021-2025 that was integrated with Sustainable Development Goals/SDGs. The development of geoparks contributes to 11 out of 17 SDGs in Indonesia. Our study reviews the development of geoparks in Indonesia, including the laws and institutions that support them, their impact on the local socio-economic of the surrounding regions through the development of geoproducts, geotourism and so on, as well as the challenges and efforts being made to continue their future development. The study starts by presenting the uniqueness of Indonesia's UNESCO Global Geopark, namely Batur, Gunung Sewu, Ciletuh-Palabuhanratu, Rinjani-Lombok, Caldera Toba, and Belitong. An analysis of local socio-economic contributions through geoparks development was made. The development of geoparks in the Gunung Sewu, Ciletuh-Palabuhanratu, and Rinjani UGG areas is indicated to significantly reduce unemployment rates. The decline in the number of poor people and the poverty rate is evident in almost all regions. In addition, the local community is more aware of the natural disasters and conservation aspects in almost all geoparks development areas.

TESTING MUNICIPAL INVENTORIES TO EXPLORE LOCAL GEOHERITAGE IN THE CHABLAIS UGGP, FRANCE

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Recognized for its geological heritage of international importance that tells the story of the formation of the Alps, and also of the last great glaciation, the Chablais UNESCO Global Geopark, France, has a formal inventory of 85 geosites. These major sites of scientific interest, of which certain are included in the French geoheritage inventory for their regional, national or international interest, have been selected using a robust methodology. To explore and share how geoheritage shapes the everyday lives of its inhabitants, its culture, local economy and future development, a new initiative has been undertaken. Working at the municipality scale, over a five-month period, a local inventory was established on the « small geoheritage » (different from the national method for the « major geoheritage »). A threefold approach was applied: a structured inventory established by the Chablais UGGp supported by the Scientific Advisory Committee, discussions and visits with local heritage associations, engagement with the school and the local inhabitants. This led to the creation of a trial inventory sheet that was carefully prepared from existing methodologies and tested in two municipalities of the Chablais UGGp. The objective is to develop and improve this basic tool applicable in any municipality. However, the importance of the project goes beyond the data collection. The interest of the project is being able to share local information, raise awareness and understanding about local geological heritage and improve its conservation. This was particularly interesting to explore because the two municipalities concerned by this project do not feature major landscaped geosites that are promoted Geopark sites. The project allowed stronger bonds to be built between the local population, their heritage and the Geopark.

Key words: geoheritage, local, inventory, conservation

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GOMBAK HULU LANGAT GEOPARK CONTRIBUTING TO THE SUSTAINABLE DEVELOPMENT GOAL (SDGS)

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Abstract Aspiring Gombak-Hulu Langat Geopark purposely put inline the program within the geopark to answer the sustainable development topic and with more specific with current sustainable development goal. At this stage geopark development 7 out of 17 goals have been identified implemented and more will be in the future. Although 20 percent of this geopark is urban area, the other 80 percent are mixed between the suburban and rural area of Selangor and there a clear gap of income among the community. Thus, geopark work to minimize the gap of poverty among the people in the urban or rural area and urban with suburban area for SDG1. Along with geopark is various aspect of education and at this aspiring geoparkSDGs 4 representing by quality education are made available to various group and in various form through geoeducation among school children, community and to public. Geopark to the state of Selangor also providing decent work and economic growth as promoted by SDG8 through sustainable tourism. As the state also known for various tourism attraction from cultural to nature, geopark provide a niche through geotourism while enhancing the existing nature-based tourism in the state. These create more business opportunity among the local. SDG 8 also create better infrastructure for tourist and local alike particularly influx of nature-based enthusiast from Klang Valley. As part of the most studied basin in Malaysia known as Hulu Langat basin, and part of Selangor Basin this geopark also exposed to various natural disaster that known to tropic region such as landslide and flood but also due post impact of old mining city that manifested in form of sink hole. It's a role of geopark to enhance existing approach to provide a safe, resilience and liveable city to the community and the visitors alike as promoted by SDG11. This geopark are represented by 50 percent of the green lung of Klang Valley and the key water catchment area with 3 mains active dam. It's become crucial for this geopark in protecting the green area for the environmental services it provides but also to keep the habitat of wildlife in this various reserved forest while connected with the main forest spine across the peninsular Malaysia to minimize forest isolation. Thus, conservation of life on land imposed in the SDGs 15 represented with various conservation effort by various agencies in this geopark. The work of geopark in this state is evidence of well collaborated work among the local stakeholder at the state and federal level. As part of Malaysia National geopark, series of sharing and partnering have been initiated between department within the geopark as well as the management of the geopark. Besides, collaboration and bench marking have been made to several regional geopark and still in progress of finding sister geopark. Partnership imposed by SDGs 17 benefited the development of geopark through, visitation, discussion, seminar and workshop.

STRENGTHENING LEGAL ASPECTS AS PROTECTION OF LOCAL WISDOM AND INDIGENOUS PEOPLE OF RANTAU KERMAH VILLAGE IN ENVIRONMENTAL MANAGEMENT

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Rantau Kermas Village is located in Jangkat Sub-district, Merangin Regency, Jambi Province-Indonesia, is one of the villages in the Serampas Indigenous Community area, which is part of the Merangin Jambi Unesco Global Geopark territory. This village plays an important role in sustainable environmental management, and has extraordinary wealth, both Geodiversity, Biodiversity, and Cultural Diversity. The geological heritage of Rantau Kermas Village is Lake Depati Empat which has been designated by the Minister of Energy and Mineral Resources of the Republic of Indonesia as the Merangin Jambi UNESCO Global Geopark Geoheritage and is also part of the Kerinci Seblat National Park Conservation area which is also part of the World Heritage - Tropical Rainforest Heritage of Sumatra. The village also has the Depati Karojayo Tuo Customary Forest, with the Tree Adoption Program as one of the flagship activities, and this customary forest has been designated by the Regent of Merangin Regency as a Biosite in Merangin Jambi UNESCO Global geopark. The biodiversity in this area includes key and rare species such as the Sumatran Tiger, Tapir, Kuwau Raja Bird and several rare plant species such as *Amorophalus Titanum*, Edelweiss and others. This area is managed with the concept of synergy and collaborative management involving the geopark, national park and indigenous people of Rantau Kermas Village, especially in the development of geotourism and education/research. The Customary Forest of the Rantau Kermas indigenous community is inherited and managed from generation to generation, with the Customary Forest Area divided based on spatial patterns, including upstream rivers, river borders, canyon land as a conserved zone and prohibited from being utilized, as well as for the use of wood as building materials is also regulated such as trees that are two circles around the diameters, flowering trees, let alone trees that bear fruit are strictly prohibited from being cut down, for anyone who violates will be punished based on customary law. The utilization zone is called the arah ajum land area, where this area can be used for residential and agricultural land whose use is regulated by the Depati and the Village Government. In general, the arah ajum land area is used as agricultural land for growing rice, secondary crops and also for plantations with Cusiavera and Coffee as superior products, which are both Indonesia's best robusta coffee and the world's best Cusiavera. The SDGs process as a global development agreement has long been applied from generation to generation by the Serampas Indigenous People, especially the people of Rantau Kermas Village and it is reflected in the governance that prioritizes local wisdom, by protecting the forest so that water sources remain stable, so that they can be used as a renewable energy source (Micro Hydro Power Plant) to meet daily electricity needs, and also used to process coffee into Roastbean and finally into ground coffee with SOP up to Great Fine Robusta with good economic value. The challenge of developing the area occurred when the area was designated by the central government as part of the delineation of the core zone of protection of the Kerinci Seblat National Park area, which hampered the access rights of indigenous peoples to be able to manage their area. To maintain the continuity and sustainability of this best practice, and eliminate conflicts between the National Park and Indigenous Peoples, the local government took the role to be able to restore the rights of Indigenous Peoples by establishing regional regulation No. 8 of 2016 concerning Recognition and Protection of the Serampas Clan Customary Law Community, this regional regulation recognizes the existence of the Serampas Indigenous Peoples, so that with the agreement of the parties, the management of Rantau Kermas Village is carried out collaboratively between interested parties. Support for infrastructure stabilization is also carried out related to road access infrastructure, health and education as well as support for affirmative funds for customary forest management.

MOUNTAIN SPORTS: CATALYST FOR SUSTAINABLE TOURISM DEVELOPMENT IN THE UNESCO GLOBAL GEOPARK OF M'GOUN

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The concept of using mountain sports as a catalyst for sustainable tourism development in the UNESCO Global Geopark of M'Goun is an intriguing and potentially beneficial approach. This strategy involves leveraging the natural beauty, unique geological features, and cultural heritage of the M'Goun region to attract tourists interested in outdoor activities such as hiking, rock climbing, mountaineering, ecotourism, and water sports like rafting, kayak, canyoning. The goal is not only to promote tourism but also to ensure that the development is carried out in a sustainable and responsible manner that preserves the environment, supports local communities, and respects the area's cultural heritage.

Before implementing any tourism development plan, it's crucial to conduct a comprehensive assessment of the region's natural resources, infrastructure, and carrying capacity. This will help determine the types of mountain sports that can be supported without causing environmental degradation or overwhelming the local infrastructure.

The Adequate infrastructure such as well-marked trails, waste management systems, and accommodations that adhere to sustainable practices are necessary to support the influx of tourists. Building and maintaining these facilities in an environmentally friendly manner is key to preventing negative impacts on the ecosystem. Also the effective marketing strategies are needed to attract adventure enthusiasts and outdoor enthusiasts to the Geopark. Highlighting the beauty, adventure opportunities, and sustainable practices of the area will help draw in the right target audience.

Sustainable tourism development should lead to economic benefits for local communities. By providing employment opportunities, supporting local businesses, and creating avenues for community involvement, tourism can become a positive force for economic growth and poverty reduction.

In conclusion, using mountain sports as a catalyst for sustainable tourism development in the UNESCO Global Geopark of M'Goun has the potential to bring attention to the region's natural and cultural assets, while also promoting responsible practices that protect these assets for future generations. Effective collaboration among government bodies, local communities, environmental organizations, and the tourism industry is crucial to achieving a balance between economic development and conservation in this unique and valuable area.

Key words: Sustainable development, Mountain Sport, M'goun Geopark, Local development

TRAINER'S TRAINING IN ARAS UGGP

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Geoeducation is one of the most important elements of informing the local community about the need to preserve geological phenomena in a geopark. Schools are considered as one of the main steps to start educating and informing the young generation. Through increasing students' awareness in a more fun environment beyond school curriculums, regarding the long-term formation of geological phenomena, they start being sensitive to the protection of these phenomena, and as protection ambassadors, they also make their families more aware of this issue. Noting the fact that the information of teachers in schools limits to the schools' books and they may have less knowledge about the principles and concepts of Geopark, increasing their awareness and knowledge about this issue makes it easier to transfer information to students. On the other hand, the presence of people familiar with the knowledge and concept of geotourism in geoparks to carry out successive educational programs can pave the way better. To carry out geoeducational programs in a better and more complete way in Aras UNESCO Global Geopark, actions were taken to train the trainers. By integrating and benefiting from the experience of the Trainer Training course (TtT) of the World Federation of Tour Guides (WFTGA) and the experience of geotour guides and geological knowledge, the trainer training course was established and implemented for the first time in Aras Global Geopark. During a ten-to-twelve-hour course, we trained interested learners who have at least a bachelor's degree, and then by holding practical courses, we get them familiar with geological phenomena in Aras Global Geopark. After that, by holding practical training courses in the schools, their skills will be assessed, and the chosen ones will be able to carry out written training programs in the schools of the Geopark as Geopark partners.

TERRITORIAL COMMUNICATION : CASE OF GEOPARC M'GOUN

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Morocco has undertaken several reforms in recent years, both in economic and social domains. These reforms should enable it to upgrade to better position itself on the international scene, particularly through the development of economic performance and the improvement of social indicators. Also, it should be noted that these reforms were carried out with the participation of the greatest number of actors and territories. In addition, with advanced regionalization, communities must play the catalytic role in the territorial development of economic and social sectors. In order to do this, they are called upon to develop the resources essential to the achievement of the objectives assigned to them. It is in this logic that territorial communication for the benefit of the region should be distinguished as a lever to be developed and not a recipe to be recovered. To become a competitive territory, attract tourism players, influence, and welcome potential investors, promote tourism heritage, arouse the interest of foreign targets contributing to future economic and social development, create a competitive advantage, and achieve many other objectives. These precious goals can only be achieved if Morocco has a strong capacity and an enormous ability to attract tourism players and investors, who are generally influenced by all the attractive factors. Territorial communication is an approach that aims to strengthen the attractiveness and competitiveness of a territory by mobilizing its assets and resources, and by enhancing its image and reputation through an effective, credible, and efficient information system. The purposes of territorial communication are multiple and can be grouped into three main categories: attractiveness, competitiveness, and economic development. Indeed, the effectiveness of territorial communication makes it possible to strengthen the attractiveness of the territory for investors, tourists, talents, and companies, to strengthen its competitiveness compared to other territories, and to stimulate economic development by creating jobs, activities, and wealth. Having the first Geopark in Africa and the Arab world in Morocco is a real asset that justifies our choice of subject. The Geopark is an important actor for the socio-economic development of the region. It will stimulate the development of tourism there, in particular geotourism and ecotourism, which will generate the creation of local businesses, thus producing new sources of income for the people. The territory of the M'gounGeopark is inhabited by a population with a rich socio-cultural heritage, with a high poverty rate. Tourism remains one of the economic levers of the region. The economic and tourist development in the area, together with the conservation of the geological and natural heritage, is therefore at the heart of the sustainable development strategy of any Geopark, to encourage economic, social, and environmental improvements. The territorial communication of the Geopark is based on several strategies, which can be combined according to objectives and aims. In the space of this communication, we will have to examine the effectiveness of the territorial communication of the M'GounGeopark and its impact on the development of the region as a whole.

POTENTIAL GEOPARKS IN SAUDI ARABIA

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The geology of Saudi Arabia includes (1) The Precambrian rocks where are found in the Arabian Shield, which is of fundamental importance to the study of the geologic history of the Earth. It is one of the largest areas on Earth with preserved Neoproterozoic young crust that was formed directly from magma. (2) The sedimentary cover which is located east of the Arabian Shield. It covers as a whole is a residual part of the Tethys Seaway, which resulted from the general and combined effects of sedimentary processes and tectonic movements around the Arabian Shield. This study aims to overview the significant inventory of the geoheritage features in Saudi Arabia such as the areas of major periods of cooling and glaciation, the emergence of multicellular life forms, the residual part of Tethys Seaway, land formations and geomorphological landscape. This inventory of the geoheritage will be analyzed and classified its heritage values to the potential Geoparks characteristics of conservation and valorisation of geological heritage sites.

THE MUZQUIZ-COAHUILA GEOPARK PROJECT (MEXICO)

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The Múzquiz Geopark project is located in Northern Mexico, close to the USA-Mexico border, in the Municipality of Múzquiz, State of Coahuila. It covers an area of 8,300 km²; the total population is about 70,000 inhabitants. The main geo interest of the geopark lies in its paleontology. The lithology is varied and includes sedimentary rocks from Cretaceous limestones to Plioquaternary basalt lava flows. Sedimentary rocks are strongly folded and faulted, forming elongated grabens bounded by uplifted blocks (horsts) up to 400 meters high. A number of fossiliferous localities stand out due to the remarkable preservation conditions; fish specimens exhibit extraordinary well-preserved fossils like fishes, including three-dimensionally preserved morphology, articulated skeletons, muscle tissue remains, and evidence of restricted organic decay (Riquelme et al, 2013). In these localities (Lagerstätten), sedimentary rocks consist of platy limestone alternating with impure chalk and marlstone with earthy texture. Most of the argillaceous material is found as stratified millimeter-thick layers of volcanoclastic bentonitic clay (Riquelme, op.cit). The Lagerstätte contains several holotypes, including the Muzquizopteryx coahuilensis, assigned to the family Nyctosauridae. It could be the oldest record of this group and the least known; it is the smallest adult pterosaur from the Upper Cretaceous discovered until 2006. An extensive collection of fossils and minerals is exhibited at the Museum of Paleontology in Muzquiz, the host city of the Project, including new families, genus and species of crabs, turtles and other specimens, as well as the most representative minerals linked to the regional mining activities (calcite, fluorite...). The territory is included in the Carboniferous Region of the State of Coahuila. Coal mining has been the most important development activity in the region, although currently several extraction plants are being closed. The MGp includes 25 geosites (of paleontological, geomorphological, mineral interest) and sites of ecological, archaeological, historical and cultural values. The western sector of the territory is part of a UNESCO Biosphere Reserve declared in 2006 and has a RAMSAR site (Río Sabinas). Likewise, the presence of peoples considered indigenous stands out, among which are the so-called Negros Mascogos and the Kikapú Tribe. The main town within the Geopark is Melchor Muzquiz, which was declared in 2019 "Magic Town" by the federal government due to its historical and cultural heritage. The Muzquiz Geopark project began in 2020, with the approval of the Coahuila State Congress and the participation of federal authorities from the tourism, environmental and cultural sector, higher education institutions, businesspersons and NGOs. It is expected that the application dossier will be submitted to UNESCO in 2023. Mexico currently has two UGGs.

GEOPRODUCTS, WHAT AND HOW? DEFINING, CREATING AND TESTING GEOPRODUCTS WITH BEST PRACTICE EXAMPLES FROM DANUBE GEOPARKS

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Geoproducs are a natural consequence of geoparks. As the geoparks are not only concerned with protecting and promoting geological features, but are actively involved in local development, geoproducs are the expected tool for adding value to local ordinary products, to revive handicrafts and to create innovative new ways to provide economic benefits for the community.

For a local product to become a geoproducs it needs to have a connection to the local community and to the geology of the place. The product must be viable from an economic point of view, to have a marketing strategy and be profitable. In order to regulate its quality, the product is sold in partnership with the geopark. This way the geopark is also promoted by the seller of the product and in the same time the geopark promotes the product.

In our article we are tackling the definition and philosophy of the geoproducs, its identity, management, production and testing strategy as well as its characteristics.

Eight geoparks from the Danube area created an on-line tool for the creation, development and promotion of geoproducs. GeoApp is a platform for showing best practice examples for geoproducs. Using gamification, the platform allows all the UNESCO Global Geoparks members to test if their local products might be geoproducs.

CODE OF CONDUCT AND GOOD PRACTICES IN PORTUGUESE GEOPARKS

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Following the working group created by the Portuguese UNESCO Global Geoparks (Naturtejo, Arouca, Azores, Terras de Cavaleiros and Estrela) and Turismo de Portugal, the Portuguese National Tourism Authority, since 2020, there was a need to homogenise procedures, namely the Code of Conduct and Best Practices in the Portuguese Geoparks.

This document establishes the ethical and practical guidelines for the implementation of management and conservation strategies in Geoparks. For the Portuguese Geoparks, this code is of utmost importance, since these UNESCO designated areas encompass significant heritage that requires careful and responsible management.

The code focuses on a series of guidelines that help the management of Geoparks, such as the promotion of education and environmental awareness, the preservation of geological heritage, the promotion of sustainable tourism and cooperation with local communities. It also sets standards for visitor conduct, encouraging respect for Geopark rules and the environment, as well as promoting visitor safety.

Its implementation is fundamental for the preservation of the natural and cultural heritage of the Portuguese Geoparks and for the promotion of sustainable tourism in these territories. By following the guidelines set out in the code, Geopark authorities and visitors can ensure that the heritage is preserved and that the visitors' experience is positive and safe. In addition, it helps promote social responsibility and ethics in tourism management, while encouraging the active participation of local communities in the preservation of the Geoparks' heritage.

In conclusion, the Code of Conduct and Good Practices is an essential document for the responsible management of the Portuguese Geoparks. It establishes important guidelines for the preservation of the natural and cultural heritage, as well as promotes sustainable tourism and the participation of local communities. Its implementation is fundamental to ensure that these areas are preserved for future generations.

This document, adopted by the 5 Portuguese UNESCO Global Geoparks, is available for consultation on the website of each of these geoparks and on that of Turismo de Portugal.

THE IMPACT OF THE UNESCO GEOPARK LABEL M'GOUN AS A CATALYST FOR ECONOMIC, SOCIAL, AND TOURISTIC DEVELOPMENT WITHIN THE REGION: CONSERVATION AND ENHANCEMENT OF HERITAGE RESOURCES IN THE M'GOUN GEOPARK.

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The M'Goun geopark, nestled within the heart of the Central High Atlas Mountain range, stands out as a region of remarkable geological heritage, encompassing invaluable architectural, cultural, and anthropological elements. Spanning an area of 5730 km², this mountainous terrain, characterized by rugged topography and deep valleys, serves as the home to a predominantly rural population. As of 2014, the region hosted 217,062 inhabitants, with 67,544 residing in the urban centers of Azilal and Demnate. In the broader Béni Mellal-Khénifra region, the population reached 2,520,776 inhabitants (RGPH, 2014). In 2014, the Géoparc M'Goun achieved the distinction of being the first UNESCO Global Geopark to receive recognition in Africa and the Arab world, a milestone it accomplished by virtue of its exceptional geological heritage. This acclaim was later followed in 2018 by the Ngorongoro Lengai Geopark in Tanzania, marking the second UNESCO Global Geopark on the African continent.

The territorial development dynamics catalyzed by this esteemed UNESCO label are rooted in the acknowledgment and preservation of geopatrimonial resources. Effectively harnessing the potential of these resources within a comprehensive territorial project necessitates the collaboration of various stakeholders. This assemblage includes elected officials, policy makers, scientists, professional mediators, tour operators, environmental and sports associations, as well as both public and private financial partners. Notably, the involvement of the local population assumes a pivotal role in fostering project acceptance and ownership.

The UNESCO label's impact on the Géoparc M'Goun and its contribution to territorial development is a key focal point of evaluation. This assessment extends to understanding how local cooperatives leverage the UNESCO Geopark status to market their regional products and how stakeholders in the tourism sector utilize this label. Additionally, an exploration of the strategies employed by the Géoparc M'Goun association to extensively promote the UNESCO Global Geopark brand while simultaneously reinforcing local social and economic sustainability is also undertaken.

In summary, the Géoparc M'Goun serves as an exemplar of geodiversity and cultural richness within the Central High Atlas. Its UNESCO Global Geopark label has propelled a multi-faceted endeavor that involves a diverse array of actors and initiatives, all aimed at harmonizing the preservation of geological heritage with the advancement of local prosperity. This intricate interplay between conservation, development, and community engagement underscores the significance of the Géoparc M'Goun as a dynamic model for sustainable territorial growth.

REVOLUTION OF DISASTER RISK REDUCTION PROGRAM IN RINJANI-LOMBOK UGGP

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Rinjani-Lombok UGGp was once hit by a series of damaging earthquakes in 2018. Since then, the DRR program in Rinjani-Lombok UGGp has greatly improved. There are 2 main paradigms of DRR programs in this geopark consisting of Passively Program (Before Earthquake in 2018) and Actively (and revolutionary) Program (End of 2018 - now). Each program has different approachments which are more local in recent times. Before 2018 (before the earthquake), we can say that there's no special program developed yet for Disaster Risk Reduction. All the activities related to DRR were focusing on geohazards and through joint-activities with limited institutions through Geopark Goes To School and with the local disaster management agency through Disaster Resilient School Program in a very small number of schools. Earthquake had changed the direction of the development program in the province, including in the geopark area. Since then, we took the DRR program based on Sendai Framework more seriously and decided to focus on children (age below 18). In this period of time the DRR are expressed in some programs such as (1) A mandatory session in every training is conducting in Rinjani-Lombok, (2) Educamp with youth and local communities, (3) Song & poetry musicalization, (4) signage, (5) Increase the awareness through IDDRR event every year, (6) Geopark goes to school which lately evolute to Literacy of Rinjani. From the 5 past years, we learned that DRR has to be known by layers of people and locally approach. Since the end of 2022, the management agency has partnered many local stakeholders to develop some communication tools for DRR. Snake & Leather game, Comic, Book, Sasak Puppet are examples of tools. The tools are developed based on the village/ geosite characteristics and local culture, so that one tool may not be suitable for another area.

EDUCATION WITH SIMPLIFICATION OF SCIENTIFIC KNOWLEDGE ACCESSIBLE TO THE GENERAL PUBLIC

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European Funding Projects are a way to create educational applications and tools for our Geopark. In 2011, we used our first EU PROJECT with the acronym “Geotopia” to renovate, furnish and equip our visitor center in Amiantos. Since then, the use of EU funding projects has been an important tool for Troodos UNESCO Global Geopark. With this tool we can develop new educational tools, games, materials, books, videos, animation educational videos for children, applications, new nature trails, alternative tourism buildings, educational guides, maps, etc. From 2011 until today, more than 10 EU PROJECTS (Interreg Greece/Cyprus, Interreg Mediterranean, Horizon, LIFE and Leader) have contributed and are still contributing to the enrichment of our Geopark in general and the Visitor Centre.

In addition to the applications and tools, we are able to collaborate with other geoparks (mainly Greek geoparks), which creates new ideas, partnerships, a sense of brotherhood and community building. In this presentation we will share the projects, the educational tools and applications that have been created, the challenges and the collaboration between geoparks.

GEO-CULTURE AT KEBUMEN GEOPARK, CENTRAL JAVA, INDONESIA

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Kebumen Regency has had a National Geopark since 2018, which will be developed as a Kebumen UNESCO Global. This Geopark includes Karangsambung Geological Heritage at the north and the Karstic landscape at the south. The geopark theme is "The Glowing Mother Earth of Java," which is 1138.7 km² of land, 21.9 km² of ocean area, and 1.167.934 population. There are 42 geosites, seven natural sites, and 24 cultural sites.

Culture results from human thinking in dealing with natural conditions and times through a learning process to fulfill their needs. Cultural diversity is not something that stands alone but is related to the geological diversity in an area. The interrelationships between landscapes and geological parameters with cultural elements give rise to certain research fields in the geosciences, such as cultural geology and cultural geomorphology. Cultural geology (Geo culture) assumes that geological conditions can influence people's culture.

The lithology of this area includes 21 formations consisting of igneous, sedimentary, and metamorphic rocks from the Cretaceous age to the present sediment. The landscape consists of 33 units, 16 mining commodities, elevation from 0 - 556 m above sea level, slope from 0 – 140%, high river density, and groundwater is scarce in productive aquifers with wide distribution. These natural conditions have resulted in the development of culture with various artifacts starting from the Megalithic Era (11 artifacts), the Hindu-Buddhist Era (12 artifacts), the Islamic Era (31 artifacts), and the Colonial Era (83 artifacts). This study aimed to determine the effect of 7 geological parameters on four cultural parameters with the GIS method.

The influence of lithology on the formation of regional culture in the Megalithic Era was 2.3%, the Hindu-Buddhist Era 11.3%, the Islamic Era 2.9%, and the Colonial Era 2.6%. Alluvial deposits have the highest percentage of site distribution in each Era, followed by the Halang Formation. In the Megalithic Era, mining materials influenced 3.8%; in the Hindu-Buddhist Era, 14.38%, especially from the sand-gravel material and iron sand sub-criteria. In the Islamic Era, mining materials had an influence level of 24.34%, especially from the sand-gravel material and iron sand sub-criteria. In the Colonial Era, the influence of mining material was 24.18%, especially in the sand-gravel material, red soil, and clay sub-criteria.

The landscape has the strongest influence in the colonial Era at 37.17%, the Islamic Era at 10.56%, the Hindu-Buddhist Era at 3.92%, and the Megalithic Era at 15.8%. The level of influence is mainly on the Fluvial landscape unit. Elevation significantly impacted the formation of regional culture; in the Megalithic Era, 11.12%, Hindu-Buddhist 2.69%, Islam 34.68%, and Colonial 3.88%. In all ages, the site distribution pattern is mostly at an altitude of 5-50 m. At this elevation, groundwater availability, agriculture is easier to develop, the wide land, transportation access is easy to reach, and there is minimal erosion and little inundation. Slopes do not have a major influence on the formation of regional culture in the Megalithic Era 6.25%, Hindu-Buddhist 5.8%, 6.8% in the Islamic Era, and Colonial 12.44%, especially on the sub-criteria of gentle slopes (< 7%).

Groundwater has significantly influenced the cultural development of the Hindu-Buddhist, Megalithic, and Islamic eras. In the Megalithic Era, 32.38%, the Hindu-Buddhist 36.05%, the Islamic Era, 16.59%, and the Colonial Era, 6.8% where most of it was in aquifers with a wide distribution in the Fluvial landscape. River has a significant influence on the formation of regional culture, especially during the Megalithic and Hindu-Buddhist eras. The Megalithic Era was 28.31%, Hindu-Buddhist 25.78%, the Islamic Era 4.06%, and the Colonial Era 12.87%. This influence is mainly from the sub-criterion of distance <750 m from the river.

The Megalithic and Hindu-Buddhist eras tended to have similar patterns on two main criteria that influenced the formation of culture: groundwater and distance to rivers. The groundwater sub-criteria are mainly in productive aquifer areas, while the river distance sub-criteria is at a distance of <750 m. Whereas in the Islamic and colonial eras, they did not show the same pattern.

A HUB AND A PLACE TO STAY IN THE GEOPARK "ENTÔ"

Atsushi Aoyama, Ama Co., Ltd (Oki Islands, Japan)

Overview

In Ama Town (Nakanoshima), Oki Islands, Shimane Prefecture, the only hotel on the island underwent rebranding as "A Hub and a Place to Stay 'Entô'" of the Oki Islands UNESCO Global Geopark, and reopened on July 1, 2021. It collaborates with the Oki Islands Geopark Management Bureau, which serves as the local Destination Management Organization (DMO). Ama Town, with a population of about 2,300, has garnered attention as a case study in regional revitalization through initiatives such as enhancing educational programs and promoting immigration policies.

Organization and Target

While the building is owned by Ama Town Office, it is operated by the third-sector corporation Ama Co., Ltd. The exhibition about the Geopark is managed by the Board of Education and the Oki Islands Geopark, with comprehensive management under the name "Entô."

The target audience is positioned as "intellectually curious national park hoppers from both Japan and abroad," focusing on affluent individuals (Tier 2, as defined by the Japan Tourism Agency) who have higher levels of temporal and economic freedom, a target audience which has not been fully tapped into in the Oki Islands area.

Background and Objectives

The project was developed with the aim of creating various effects on the environment, education, and tourism, rather than simply being a luxury hotel. After six years of planning, it opened to the public.

Content and Key Points

Thorough branding as a Geopark Hotel was conducted, and it was successfully reflected in the architecture, design, and operational structure. This enables guests to naturally experience, learn, and engage with the Geopark, creating opportunities for them to do so throughout their stay. Collaboration with various educational and public sectors on the island, including the library, is being realized, gradually moving towards the concept of a "hotel for the entire island."

GEOLOGY OF THE TORATAU ASPIRING UNESCO GLOBAL GEOPARK (RUSSIAN FEDERATION).

Ardislamov Faniz

The Toratau Geopark is located at the junction of the southern part of the Ural Mountains and the eastern edge of the East European Platform. The territory is rich in unique geological objects. They are of scientific, historical, and natural value.

The age of rocks ranges from 1 billion to 250 million years. The main objects of the geopark are the Usolka and Dalny Tulkas geological section (GSSP), the shikhans (paleorifs) of Toratau, Yuraktau and Kushtau, as well as other reference sections of the main divisions of the Upper Riphean (Tonian) and Vendian (ediacaran), sections of the Middle and Upper Devonian, Carboniferous and Permian.

The Usolka geological section is the first object of international importance in Russia. The "golden nail" GSSP of the lower boundary of the Sakmar stage of the Permian system of the International Stratigraphic Scale. It is composed of terrigenous-carbonate rocks with layers of volcanic tuffs.

The geological section of the Dalny Tulkas - GSSP of the lower boundary of the Artinskystage of the Permian system of the International Stratigraphic Scale. It is composed of terrigenous-carbonate rocks with layers of volcanic tuffs.

The central objects around which the Toratau geopark is organized are the "Sterlitamak shikhans": Toratau, Kush-tau and Yuraktau.

They are fragments of a reef system that bordered the shelf margin of the Eastern European continent in the Early Permian (280-300 million years). Subsequently, the reefs were buried under a layer of sediments, and about 5 million years ago, the Shikhan block was brought to the surface as a result of neotectonic movements.

The geological sections of the Ashinsky series (the Kuk-Karauk section 1, 2 and 3) are also of great importance, in which the macrofossilia of the Edaikar type *Kuckarauki multituberculata* is described and includes a layer of volcanic ash aged 573.0+/-2.3 million years. In the Kuk-Karauk 2 section, detritus zircons isolated from rocks of the formation have an age spectrum close to the Queensland orogeny of the Australian continent verification of the idea about the spatial conjugation of Baltica and Australia within the Rodinia Supercontinent (a positive test of the "Australia Upside Down conception").

A section of the RyauzakFranskystage of the Upper Devonian, a condensed type, in which the boundary between the Fransky and Famenskystages is established and the event of the mass extinction of the Upper Kellwasser Event is recorded.

On the border of the Devonian and carboniferous sections of the Siqaza and Zigan, a clay layer corresponding to the Hangenberg event is traced.

GEPARKS, SUSTAINABLE TOURISM AND LOCAL DEVELOPMENT THE “FOREST OF THE ROCKS”: AN EXHIBIT TO EXPLORE THE GEODIVERSITY OF SESIA VAL GRANDE UGGP

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On the occasion of the first UNESCO World Geodiversity Day (6 October 2022) and the 16th European Geopark Conference "EGN2022" (Verbania 26-30 September 2022), the University of Turin in collaboration with the Earth Sciences Department proposed an initiative of high scientific value, dedicated to the theme of Geodiversity in the Sesia Val Grande UGGp, through an exhibition path and a multimedia installation that transformed the Rectorate Courtyard of the University of Turin into “a window on the world of Geoparks”.

The exhibit, “GEOdiversUniTo: the Forest of the Rocks”, is a multimedia installation for showcasing the geodiversity of the UGGp, with features from the Sesia Val Grande UGGp. The exhibit consists of objects (rocks, artefacts, water, ice), sounds, and images illustrating the variety of landforms, materials, and geological processes that characterize not only the Sesia Val Grande UGGp but also the other Geoparks in Italy, to celebrate Geodiversity, enhance the Geological Heritage and promote Geotourism within the Global Geoparks Network.

The main attraction of the exhibit was located at the center of the Rectorate Courtyard. The installation reproduces exactly the shape of the Sesia ValgrandeUGGp and accommodated materials belonging to human and natural action within the Geopark (sediments, water, materials transformed by man and by nature itself, etc.). Those materials are confined within metallic containers or placed on metal pedestals of different heights.

In particular, the exhibit shows a unique geodiversity space, with rocks from Earth’s mantle, lower and upper crust to sedimentary rocks, of utmost importance. In this way, the visitor can move around the installation and appreciate a geological cross-section of the Sesia Val Grande Geopark within a few square meters. Hence, the “Forest of the Rocks” is a representation of the geological and cultural heritage of the Geopark.

The significance and goal of the “Forest of the Rocks” are making people aware that rocks can be “alive,” as wood, but in geological times, difficult to sense by non-expert people. Moreover, knowledge of geodiversity makes the prevention and mitigation of natural hazards and risks easier. To ensure these results, the language used in the exhibit has been studied to be understandable by the general public.

The other part of the exhibit is composed of an itinerary divided into four thematic sections, with panels that show how the geodiversity features determine the value of natural and cultural heritage.

The aim of this exhibit, which can be moved to various places as an itinerant exhibition, is to encourage a “global” reflection on the man-nature connection, with tangible examples of adaptation to climate change, sustainability in the use of georesources, and historical research activities, which allow for the balanced development of the territory.

AN EXAMPLE OF HUMAN INFLUENCE IN SHAPING THE NATURAL LANDSCAPE: BIN TEPELER GEOSITE (THOUSAND HILLS) MANISA-TURKEY

Ahmet Serdar AYTAÇ, Tuncer DEMİR, Faruk BİNGÖL, Yiğit KARAKUZU

Mankind has been influencing and changing the natural environment with its activities since the first ages of history, and in the meantime, shapes the earth. The area where the Kula Salihli UNESCO Global Geopark is located in Western Anatolia is one of the places where human activities in Turkey date back to ancient times. The stone tool dating back 1 million years found in the terraces of the Gediz River in Kula, the human footprints dating back to 5 thousand years BC, and the so-called bloody rock on which the volcanism was drawn are the most important pieces of evidence of human activities in the region. Similarly, Roman, Lydian, Seljuk, and Ottoman civilizations have had significant effects on the natural environment and landforms in the recent period. One of the geosites where human beings have caused large-scale changes on landforms in historical periods is located in the west of the Kula-Salihli UNESCO Global Geopark. A group of significant royal tombs known as Bintepe (Thousand Hills) is located all along the route between Salihli and Akhisar, 8-10 km north of the Gediz River, in an area of nearly 74 square kilometers. Bin Tepe is the largest tumulus cemetery in Turkey. These 119 tumuli scattered across the area between the ancient city of Sardis and Marmara Lake belonged to the rulers of Lydia. The dimensions of these tombs vary depending upon the social status of their owners. Three of the largest burial mounds-tumuli are said to have belonged to the famous Lydian Kings, Giges, Alyattes, and Ardys. The largest tumulus, 63m. High is thought to have been the burial place of King Giges. It is also the region of a major, newly discovered Bronze Age kingdom contemporary with the Mycenaean Greeks, the Trojans, and the Hittites. The Thousand Hills is currently on the tentative list for listing on the UNESCO World Heritage List. Thousand hills are evidence of the change that human has created in topography about 3 thousand years ago. This study aims to reveal the amount of topographical change made by the Lydians, by way of spatial analysis in around the Bintepe geosite.

COMMUNITY FORUM AS A TOOL FOR THE DEVELOPMENT OF LANGKAWI UNESCO GLOBAL GEOPARK BLUEPRINT

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Local community is one of the main keyholders with regards to geopark development. Continuous participation and empowerment initiatives enable the local community to foster synergies and establish strong collaborative and sustainable projects with the geopark management/authorities. In order to sustain the involvement of the local communities, and in shaping geopark policies, strategies and future projects, a community forum was conducted with the objectives of prioritizing community issues and challenges as well as gaining perspectives and input on a wide range of topics. The theme of the forum alluded to the need to develop strategies and recommended actions leading to SDGs. A set of best practice guidelines and templates were used to help increase the diversity and representation of ideas from the 150 local community who participated in the forum, moderated by six experts and six facilitators. This paper presents a consolidation of salient ideas and perspectives i.e., the outcomes that emerged from the community forum on five main areas: heritage conservation, geo and sustainable tourism, public education, geotourism products, sustainable development, and local community development. The outcomes (recommendations) are used to shape the new Langkawi UGG Blueprint which is a five-year management plan to further accelerate Langkawi UGGP future development and priorities for actions.

CO-MANAGEMENT OF GEOFOREST PARKS IN LANGKAWI UNESCO

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Langkawi UNESCO Global Geopark in Malaysia has three geoforest parks that require effective management to ensure conservation and sustainable development are taken place the co-management model, involves a collaborative approach with local communities, government agencies, and non-government organizations. This creates a sense of ownership and responsibility among the community, ensures equitable sharing of tourism benefits, and incorporates local knowledge into park management. The management plan includes measures such as clear boundary, zoning, visitor management, waste management, and community-based conservation initiatives to protect the parks' resources and at the same time promote sustainable tourism. This paper will discuss the co-management model's successes, challenges, and potential as a sustainable tourism development model for other geotourism destinations, highlighting the importance of community participation and collaboration in geoforest park management.

GEOTOURISM AND SOCIO-ECONOMIC DEVELOPMENT IN URBAN SETTINGS THROUGH GOMBAK-HULU LANGAT GEOPARK

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The Gombak-Hulu Langat Geopark, the first National Geopark in Selangor State and the 7th in Malaysia, is a protected area encompassing numerous ecological, geological, historical, and cultural sites. The Geopark is based on the 'Urban Geopark' concept highlighting 20 geosites in two Selangor districts, covering 1,129km² hectares of mix urban and suburban area, with 13 in Gombak and 7 in Hulu Langat. The preservation of natural resources, including mountains, forests, flora, and fauna, is critical, and the Geopark is an important cultural and natural asset that benefits Selangor's inhabitants. Geotourism and ecological tourism, which promote the development of local businesses and create new income-generating opportunities for the community, are essential components of the Geopark's role in the socio-economic growth of the region. Furthermore, Geopark offers scientific and environmental educational programs, serving as a platform for education. To raise awareness, income, and cultural value in Selangor, Malaysia, Geopark engages the community in tourism-related activities to sustainably create geosites of national, regional, or international importance.

The 20 geosites that use for geotourism in Gombak - Hulu Langat Geopark consists of the evidence of rock deposited in the Early Palaeozoic (late Cambrian, around 500 million years ago) to Late Paleozoic (Middle Permian, around 270 million years ago); before intruded by igneous rocks of Early Mesozoic age (Late Triassic, about 220 million years ago to Early Jurassic, about 200 million years ago) that create Peninsular Malaysia. A series of ancient tectonic activities are also being preserved in this geopark including the suture of Devonian to Middle Triassic Palaeo-Tethys ocean, Late Cretaceous fault that creates basins and the fault that later filled with quartz mineral. The basins fill with the continental sediment of the Neogene (Miocene, between 23 and 13 million years ago) and quaternary sediments hundreds of thousands of years old that also includes coal and minerals of economic value.

The Selangor State Government is encouraged to prioritize environmental protection and achieve the Sustainable Development Goals (SDG) through its affiliation with the Gombak-Hulu Langat Geopark. This aligns with the First Selangor Plan (RS-1) which aims to transform the state into a smart, livable, and prosperous community by 2025. The Gombak-Hulu Langat Geopark aims to become a developmental model that promotes responsible tourism, regional growth, and preserves the area's natural, cultural, and landscape heritage with the involvement of all stakeholders.

DAK NONG UGGP'S GEOPARK EDUCATIONAL ACTIVITIES FOR THE YOUTH

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Dak Nong Geopark (Vietnam) has been recognized as a UNESCO Global Geopark in July 2020. To further promote its heritage to local people, especially to the youth for better understanding of conservation and development, Dak Nong Geopark Management Board has cooperated with many partners to diversify the activities for the local youth. In detail, about the educational material: Currently, there are many kinds of documentation for 7 – 15 years old, such as: comic books, legendary books, rock boxes, and school information panels. The space of geopark education is not only in the classroom but also outside the classroom, which brings pupils closer to nature. The educational topics are various from geological features, environmental protection, recycling workshops to how to live in harmony with nature.

Moreover, after training for students, we also co-host with other geoparks for Geopark online exchanges. In such activities, students are encouraged to share about their geopark beauty as well as learn from other geopark's characteristics.

Additionally, Dak Nong UGGp Management Board in coordination with Dak Nong Department of Education and Training annually holds the Geopark Tour guide Contest for High and Secondary School students.

IDRIJA BREAKFAST – A SELECTION OF TASTES COMBINED IN A DELICIOUS MEAL FOR AN EXCELLENT START TO THE DAY

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In Idrija UNESCO Global Geopark, a product called IDRIJA BREAKFAST consisting of delicacies created by nature and the people of Idrija was designed. Delicious dairy and meat products, honey, and tea follow the spirit of tradition and local know-how. The Idrija Selected certificate of excellence ensures that these selected delicacies are of high quality and locally sourced.

The Idrija breakfast is designed as an additional offer for tourist accommodations in our Geopark, which do not serve their own breakfast. The main purpose of the product is to offer guests a taste of local products and to encourage them to visit local producers in person, to see their farms and stores, or the experiences they provide. Furthermore, the Idrija Breakfast can also be a perfect gift.

It is a good example of connecting local providers in a joint project, which promotes the connections between local food and geological heritage, contributing to the development of the local economy and to short supply chains. Through the promotion of the breakfast, the local products and producers can become more recognizable.

The tasty Idrija breakfast for two persons consists of:

fruit and plain yogurt, cheese, and butter from three local farmers who supplemented their primary activity of cattle farming with processing milk into various delicious dairy products, meat products and bread prepared by an agricultural cooperative who devote special attention to the quality of goods in their stores. Their “home corners” therefore offer a rich assortment of products sourced in the Idrija region. Their meat products follow traditional procedures of meat processing and are made from the highest-quality meat of local geographical origin, honey from the local beekeepers who received multiple awards for their product, herbal tea from the House of Herbs situated 1000 m above sea level, where the owner pursues her career inspired by the love of nature. Using traditional manual processes she extracts beneficial “essences” from herbs and transforms them into herbal preparations and products, seasonal fruit from Slovenia

The Idrija breakfast can be bought online. It is prepared by Kmetijsko Gozdarska Zadruga Idrija and can be collected in their local grocery stores. It comes with a gift, a family ticket to the Idrija UNESCO Global Geopark Visitor Centre exhibition "Written in Rocks" with an audio guide. Plans for the future are to develop vegetarian and family versions of the breakfast. We would also like to include local culinary products in a picnic basket as an additional offer to the 23 hiking and biking trails in the Geopark.

THE ROLE OF CAVES IN THE DEVELOPMENT OF TOURISM IN KOSOVO

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From a geological perspective, Kosovo is located in a very specific area. It is characterized by a distinguished diversity of geological formations. It starts from the old crystalline rocks of the Paleozoic up to Quaternary rocks, including various types of sedimentary and magmatic rocks and metamorphic rocks that are less prevalent. Karst terrains in Kosovo are built from karstified limestone of Triassic and Cretaceous ages and of Paleozoic marble.

These terrains include an area of 1.423 km² or 13.1% of Kosovo's territory. To date, over 200 caves and abysses have been registered in Kosovo, but it is thought that the number is much higher. The number of protected caves in Kosovo is 20 (2022) which includes an area of 459.79 ha, or 0.4% of the surface of protected areas.

The largest number of caves in Kosovo are located within protected zones such as in the National Park "Bjeshkët e Nemuna" ("The Cursed Mountains"), the National Park "Sharri", the Nature Park "Liqeni i Vermicës dhe Mali Pashtrik" ("Lake Vermica and Pashtrik Mountain"), Natural Monument of Special Importance "Ujëvarat e Mirushës" ("Mirusha Waterfalls"), etc., and in the vicinity of tourist zones such as: Bifurcation of Nerodime River, Waterfalls of Mirusha River, Drini i Bardhë karst spring, Rugova Gorge, Gorge of Prizren's Lumëbardh, etc.

To date, over 30 km of corridors and underground galleries have been explored in Kosovo. The majesty of the corridors, galleries, lakes, underground rivers, the shape and variety of stalagmites, stalactites, cave curtains, cave fauna, archaeological traces, etc., make the caves very attractive for tourists and offer an important potential for sustainable development of geotourism in Kosovo.

Kosovo caves offer numerous geological, geomorphological, cultural, biological, educational, and touristic values, but there are only three open caves for visitors (Gadime cave, Radac cave, and Kusari's cave). In recent years, there has been great interest in visiting and exploring caves by local and foreign visitors; also, the negative effects inside caves have increased as a result of the large number of visitors and poor cave management. Drafting the projects and plans for good cave management and the creation of touristic infrastructure would have an impact to increase the number of visitors to the caves, and the caves will be turned into important zones for the development of tourism in Kosovo.

CO-WORKING OF SPANISH UNESCO GLOBAL GEOPARKS RESULTS IN A NEW DIDACTIC BOOK FOR TOURISTIC SELF-PROMOTING

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Discovering the exciting karst, enigmatic caves and surprising volcanic tubes through visiting Geoparks is the main message of a new didactic book produced by the Spanish Geopark Forum. The publication, in hard copy and digital versions, boasts 120 pages and 163 work arts and offers a comprehensive portrayal of the karst in Spain for all audiences, encompassing both surface and subterranean landscapes, as well as volcanic cavities of Canary Islands. The book is the outcome of a collaborative effort of Spanish Geoparks and experts in karstology, speleogenesis, volcanology, groundwater, geoheritage, palaeontology and archaeology spanning three years, by initiative of Courel Mountains UGGp, which has funded the publication.

The book's introduction highlights the karst and volcanic areas of Spain as extraordinary geoheritage, and explains what is a UNESCO Global Geopark (UGGp), the Global Geopark Network (GGN), the European Geopark Network (EGN), and the Spanish Geopark Forum.

The main body of the book consists of a chapter per UGGp, with a specific feature focus: karst depression and karrenunderscored in Sierras Subbéticas UGGp, relict karst forms protected in Las Loras UGGp, a paleo-karst preserved in Sierra Sevilla Norte UGGp, karst lakes featured in Orígens UGGp, underground streams hidden in Courel Mountains UGGp, deep caves explored in Sobrarbe-Pirineos UGGp, speleothems shown in Villuercas-Ibores-Jara UGGp, paleoclimate records studied in Maestrazgo UGGp, a salt karst within Catalunya Central UGGp, volcanic tubes developed in Lanzarote y Archipiélago Chinijo UGGp, paleontological sites kept in El Hierro UGGp, Prehistoric caves investigated in Molina-Alto Tajo UGGp, and rock art discovered in Basque Coast UGGp.

The chapters have direct reference to key items about Science and Geoparks, for instance, geoheritage, geodiversity, geoconservation, education, natural resources, Global Change, geohazards, ecology, cultural heritage and human development linked to caves. Each chapter finishes with a tourism promotion subsection related to the specific feature and the UGGp authoring the chapter. By this way, a large variety of UGGp facilities such as geosites, geo-routes, viewpoints and visitor centers are advertised. The book's chapters have been written following editorial guidelines of Courel Mountains UGGp and 18 experts have ensured the accuracy and the rigorous simplification of information. Furthermore, the contribution of the experts to elaborate of a comprehensive glossary has been essential.

Overall, the book represents a significant milestone for the Spanish Geoparks Forum in promoting their territories, geoheritage, geodiversity and science, as well as in the advance of geotourism and local development. It reinforces the Spanish Geoparks labeling as a seal of quality.

SHILIN UGGP: A PERFECT EXAMPLE OF GEOCONSERVATION AND MANAGEMENT

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Shilin UGGp is located in southwestern China's Yunnan province. It is unrivalled in the multi-phase complexity of its evolution from Middle Permian to the present; it was once covered respectively by basalt lava and lacustrine red bed. The Geopark is therefore of great geological and geomorphological significance. Shilin preserves and displays all pinnacle-like karsts, almost every existing distinctive pinnacle karsts can be identified in the Geopark; it is regarded as a great natural wonder.

In order to achieve sound conservation, much has been done since Shilin was designated as a Global Geopark in 2004: conservation legal framework has been enhanced and related regulations were implemented; Shilin Global Geopark Administrative Bureau was officially established and responsible for the unified management of the Geopark; Master Plan has been conducted to reinforce geoconservation; the Geopark is defined with clear boundary and size, zones for different function; Shilin Research Center was established and 1% of the ticket revenue is allocated as research fund and carried out scientific projects every year; got local community involved in protection; a series of conservation programs have been carried out such as digital management system, geographic information system (GIS), ecological environment recovery, soil and water conservation, infrastructure construction, data of geological heritage in protected areas and so on. These measures and unremitting efforts lead to effective protection and sustainable development of the Geopark.

SHILIN UGGP GREATLY STIMULATES LOCAL SUSTAINABLE DEVELOPMENT

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ShilinUGGp is located in southwestern China's Yunnan province. It features numerous pinnacle-shaped limestone clusters, and inside the Geopark late Paleozonic carbonate rocks, in which diverse plateau karst landscapes developed, occur extensively. Landscapes occurred in the Geopark include plateau hill, low-medium mountain, depression, basin, doline, rock hill, stone forest karst, clint, cone karst, cave, river valley, etc, of which, the stone forest karst is the most striking and spectacular landscape. Clusters of stone pillars of various shapes and sizes are distributed in various topographies, displaying unique plateau karst landscape and exceptional natural beauty.

After Shilin become a geopark in 2004, tourism became pillar industry and greatly contributed to local sustainable development as followings:

Firstly, protected geoheritage and environment. With well-staffed management body, national and provincial laws and regulations, master planning and clear boundaries, the awareness of the public is raised and the geoheritage and natural environment is well protected. Secondly, promoted geoscience among the general Public. Popular science is well spread by interpretation panels, geopark museum, official website, self-guided tour service system, geoscience handbooks, training workshops, geotourism and popular science activities, etc. Thirdly, stimulated local development. Local industrial structures were upgraded; new jobs were created inside and outside the geopark; rural income was increased by developing rural tourism, leisure agriculture and homestay economy; promoted tourism products with local features such as food and snack, fruit, handicraft, Shilin cigarette, etc.

GEOTRAIL CHARACTERIZATION BASED ON REGIONAL GEOLOGICAL HISTORY IN THE UNESCO GLOBAL GEOPARK IJEN, EAST JAVA

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Geopark is one of the UGG geoparks in East Java Province, precisely in Banyuwangi and Bondowoso Regency. The geological history of the Geopark began during the Oligocene-Miocene, which was marked by outcrops and hills from the volcano in the south of the geopark area due to the subduction of the Indo-Australian Plate to the Eurasian Plate. About five million years ago these mountains had died, then due to changing of subduction's, volcanoes were formed which are now to the north as far as fifty kilometers from their initial position. There are several mountains that are formed in the north, such as Mount Baluran, Mount Ringgit, Complex Purba, until the youngest is Mount Raung.

The evolution of tertier volcanoes that once lived in the south and then was replaced with quarter volcanoes in the north becomes an interesting story when the journey is uncovered by geochemical data from product samples resulting from eruptions that have ever existed. The results of geochemical samples with a variety of constituent elements are the key to revealing the evolutionary history of volcanoes in this area. Of course, this travel story can be used as geotourism material for the history of the volcano that underlies the Geopark which is being proposed to become a UNESCO Global Geopark by the Government of Indonesia.

THE MOROCCAN APPROACH TO TOURISM DEVELOPMENT OF GEOPARKS. THE CASE OF THE M'GOUN GEOPARK: A JOURNEY IN THE FOOTSTEPS OF DINOSAURS.

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To enhance the attractions of the Beni Mellal Khénifra Region, the structuring of natural ecosystems was carried out, based on the principles of networking, thematization and tourism development of all the natural and heritage components identified at this region. A partnership agreement has been concluded to govern the financing and implementation of tourism projects included in the Béni Mellal Khénifra PDR over the period 2020 - 2024 for a total amount of 172 MDh with a contribution from the Department of Tourism - SMIT of 21, 50 MDH.

To enhance the attractions of the Region, Nature ecosystems have been structured, based on the principles of networking, thematization and tourism development of all the natural and heritage components identified at the level of the region.

In order to materialize the tourist experience, five circuits have been identified and should be broken down by taking into account the existing product for the sake of complementarity and integration of the offer in three stages, namely (i) the enhancement of the sites the most emblematic natural tourist sites (ii) improving reception and (iii) setting up interpretation and animation.

In order to stage tourist experiences for the benefit of tourists, routes have been produced and schematized via several stages reflecting the different circuits of the Region and the main resources to be valued according to three levels (Readability, attractiveness and anchoring of the product). Thus, five main circuits have been developed.

Indeed, the international tourist dimension enjoyed by the destination of "Azilal", the Region's loss leader, being the result of an image built up after some thirty years since the launch of the tourism development project in the Central High Atlas during the 80s, to which was added the awarding of the "Global Geopark" label by UNESCO. It is obviously necessary to capitalize on its major assets to build a global theme of the Region by taking advantage of these achievements and this is how it was proposed to federate the development of the regional tourist product around the theme "Valley dinosaurs".

To this end, more than 90 MDH has been reserved for the development of the M'goun Geopark within the framework of this partnership agreement, i.e. more than 52% of the overall investment mobilized within the framework of this agreement, including two structuring projects (Dino park and tourist signage) will crystallize the overall theme with the support of so-called "Dino - Relay" projects.

For nearly 100 Mdh, the Dino parc is an original fun and leisure project whose purpose is (i) the organization of the regional entertainment offer around a unifying product and (ii) the enrichment and strengthening the positioning of the M'Goun Geopark via complementarity with the Geopark Museum with a scientific scope.

Tourist signage, a construction site as structuring as the Dino parc for the product of rural and nature tourism at the level of the Region, has been budgeted for 22 Mdhs with the aim of increasing the readability and visibility of the territory for tourists and visitors. Indeed, the study of the circuits will allow the identification of the needs and produce a coherent signage plan. Particular attention will be devoted to the natural and cultural resources and to the various wealth, material and immaterial of the Region.

The Framework Agreement for the "Sustainable Tourism Switzerland Morocco" 2020-2024 (TDSM) program signed on June 09, 2020, aims to boost the development of sustainable tourism in the BMK Region, through an overall investment of 38.5 MDh. The Integrated Program is structured around three pillars, namely:

- Pillar 1: Improve the sustainable management of the destination: Creation of the SDR Tourisme Atlas;
- Pillar 2: Strengthening competitiveness and access to the tourism market by improving the quality of rural accommodation: Rehabilitation of 18 HTR / 40 planned;
- Pillar 3: Development of skills in tourism: Training of 45 trainers and monitors in the fields of sustainable operational management, rafting, climbing, interpretation of the geomorphological landscapes of the M'Goun Geopark.

COOPERATION IN THE FIELD OF EDUCATION ON HERITAGE AND EDUCATION FOR SUSTAINABLE DEVELOPMENT BETWEEN THE VILLUERCAS-IBORES-JARA UNESCO GLOBAL GEOPARK AND THE MONFRAGÜE AND TAJO INTERNATIONAL BIOSPHERE RESERVES.

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This communication relates the positive result of the cooperation among the educational projects carried out by the Villuercas-Ibores-Jara UNESCO Global Geopark together with the Monfragüe and Tagus International Biosphere Reserves; territories located in the province of Cáceres, Extremadura, Spain. The institutional relationship between the Provincial Council of Cáceres (institution responsible for the Geopark) and the Education Department of the Government of Extremadura (Delegation of Cáceres) has facilitated constructive and cooperative development around education on heritage and sustainable development, ESD. This process is also based on the recognition of these territories under different programmes of UNESCO in whose statutes, sustainable development is a common objective.

The communication must also serve to show understandable procedures and practices as a concrete contribution of the Villuercas-Ibores-Jara Geopark and the Monfragüe and International Tagus Biosphere Reserves to the development of their UNESCO programs. As such, it will be communicated at the International Geoparks Conference (Marrakech, 2023) and sent to UNESCO through the Spanish National Commission for Cooperation with UNESCO.

Taking as background the educational procedures and results in our Geopark, its extension to both Biosphere Reserves has shared its general objective, according to which, "the educational project will allow the appropriation of the geological, natural and cultural heritage to its population, in a way that permit them to internalize it emotionally and cognitively, preserve it and contribute to its dissemination and development in the global context of our time".

Two specific objectives are explained in this communication:

Facilitate the acquisition of knowledge and awareness of heritage. Developed through teacher training activities; classroom and field activities; production of educational materials such as games, stories and focused murals on centres and towns walls.

Contribute to the global objectives of education for sustainable development. Developed through the creation of a regional Working Group on ESD; organization of regional ESD Conferences and Seminars; favouring the integration of the SDGs in educational activities and, finally, promoting inter-territorial and international educational exchanges.

GEOTOURISM: PRIVATE SECTOR, THE ENGINE OF THE LOCAL DEVELOPMENT

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Abstract

The Baque Coast UGG joined the network in 2010. Since the beginning, tourism private sector has very supportive with the Geopark. This part of the Basque Coast, that covers the Geopark and includes Zumaia, Deba and Mutriku municipalities, has not been the most favored place historically because the distance from the capitals, among other reasons. The achievement of the Geoparks brand was very well received, especially by the local private sector related to tourism. The brand provided them with a distinctive from their competitors in nearby and well-known municipalities. During these 13 years being Geopark, the brand has acquired great relevance and visibility in Basque institutions and has become a "Top Experience" level. Both, for Euskadi-Basque Country and for GipuzkoaTurismo, regional and provincial promotion bodies.

In 2018, Basque Coast Geopark joined the Spanish Ecotourism Club and together with it, also the 18 tourism companies that were partners of the Geopark at that time. Since then, these partners have not only benefited from the Geoparkea brand but also from the Ecotourism Club that carries out international promotions, supported by the Ministry of Tourism of the Government of Spain.

Ecotourism or geotourism is the tourism model promoted by Geoparkea. This kind of tourism takes place in the natural environment, works with local suppliers generating wealth and employment for the territory. In addition, ecotourism is based on interpreted tourism, this is where both natural and cultural heritage is protected and valued. However, the Geoparkea destination will be more, or less ecotourism destination depending on the involvement of the companies in achieving the objective. We are all in the same boat and we must row in the same direction. For this, some criteria have been established that companies must achieve to advance in sustainability and ecotourism.

The collaboration between the managers of the Geopark, the municipal tourist offices and the tourism private companies is very close and facilitates continuous improvement, taking advantage of synergies and helps territorial cohesion between agents. All the agents follow the same tourism model.

Once each two years, experts from de Geopark visit its partners (hotels and activities companies) to control the application of the rules and to help them to achieve the objectives. Apart from that, each two months there is a meeting among all the agents with different purpose as capacity building, actions for annual management plan, etc.

INTANGIBLE HERITAGE IN THE APUAN ALPS UNESCO GLOBAL GEOPARK (ITALY)

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Safeguarding humanity's intangible heritage is a goal that UNESCO strives for. Among the many actions that have been undertaken to achieve it, the process of inventorying the living expressions of culture succeeds in raising awareness about their importance, encouraging responsible creativity and sustainable development in the communities where they originate.

In the Apuan Alps UNESCO Global Geopark in Italy, inventory activities in the research, conservation and promotion of territorial identity have been carried out for the past twenty years. The intangible heritage is always strongly intertwined with the tangible aspects (natural-geological and cultural) of its native area and is a powerful means of strengthening the evident heritage and identity of locals, as well as being a driver for environmental protection.

In this contribution, the main actions for the strategic line of conservation and promotion of the intangible heritage of the Apuan Alps and consequent results are presented. After defining what local identity means for the specific territory involved, relevant examples of the collaboration and participatory work of cultural recovery by the Geopark and its local communities are explained. An achieved result was the restoration of the observation posts and dugouts of the Gothic Line, an Italian defensive line of WWII and now a "place of memory" thanks to the creation of illustrated paths. Another effort moved back in time to the re-enactment, historical reconstruction, and convivial storytelling in the context of traditional festivities of the local legacy of the Middle Ages. The cuisine of the Apuan Alps, together with the distinctive skills and expertise needed for its food production, was analyzed in order to best preserve and promote the local, intangible expression of Italy's food and wine culture. Terracing works with dry stone walls demonstrate a skilful integration between elements of geological heritage, agricultural settlements and intangible know-how that was already acknowledged in the Traditional Knowledge World Bank. Finally, the editorial activity of "ActaApuana", the Apuan Alps UGGp scientific magazine, collects since 2002 studies on the territory and all its physical phenomena and cultural expressions, as well as the activities and actions adopted by the Geopark to preserve and enhance them.

CONTRIBUTIONS FOR ADAPTIVE MANAGEMENT OF THE AROUCA UNESCO GLOBAL GEOPARK (PORTUGAL) TO CLIMATE CHANGE

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The Paiva, Arda, and Caima rivers drain the territory of Arouca UNESCO Global Geopark (Portugal) and are valuable ecosystems. Currently, as a result of climate change, the Arouca UGGp is facing some extreme meteorological phenomena and events that, together with the increase in the presence of pests and diseases and the expansion of invasive alien species, lead to the degradation of these ecosystems, affecting the activity and quality of life of the inhabitants of this rural territory.

Taking into account this reality, in the last years, several rehabilitation projects have been developed in sections of the hydrographic network and riverside ecosystems, based on active and adaptive management that contributes to its conservation, in ecological, social, economic, and landscape dimensions. These projects also constitute demonstrative adaptation actions and contribute to the increase of the community's environmental literacy. It is reached through extensive work to promote citizen participation, namely volunteering, and the promotion of activities aimed at schools, allowing students and teachers to be involved and, consequently, making society and the population aware of the importance of individual action in reducing and mitigating climate change.

The construction of the «Ecovia do Arda», inaugurated in 2022, and the «Requalification and enhancement of the Arda River» are projects that contribute to this desideratum. «Ecovia do Arda» is a pedestrian and cycle path, located on the right bank of the Arda River, with about 11 km in length (equipped with information panels with contents regarding geology, biodiversity, and cultural aspects of the valley). This infrastructure allows soft mobility along the urban center of Arouca, an important alternative either to going to school or to work, reducing its ecological footprint. In this area, in the scope of the «Requalification and enhancement of the Arda River» project, several actions are also carried out to reduce the risk of flooding and erosion on the banks and bed of the watercourse. Among them can be identified the control of invasive alien species, the promotion of natural regeneration of native vegetation and hydrological regularization, measures that contribute to the integrity of these ecosystems and increase the territory's resilience to climate change, improving the knowledge and quality of life in the Arouca UGGp

TRADITIONAL ARCHITECTURE OF VOIOS TOWNSHIP, GREECE: WISDOM AND ARTISTRY FOR ALL TIME

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Geopark Grevena-Kozani is located in the province of West Macedonia, north-central Greece, an area famed for its traditional stone architecture. During the Ottoman Period, this region served as an international mercantile center and many of the local Greek communities acquired significant wealth. Moreover, the Voios region, which includes the northern parts of the geopark, was known for its high-quality building stones and wood, and the local craftsmen became renowned for their skills in masonry and other building arts.

The traditional architecture of the Voios region provides a window into the illustrious communities of the past, combining great splendor with enlightened design and high technical and artistic skills. One of the finest examples in the geopark is Poulkos Manor, in the town of Siatista, which is operated by the local council as a museum. Visitors to this historic home can gain insights into the daily life and challenges of a well-to-do merchant's family of the 17th-19th centuries. By today's standards, the design of this home is radical, as it was a multifunctional, adaptable, eco-conscious space, created before such concepts existed in the public awareness. Moreover, the artistry of the paintwork, frescoes, plastering, woodworking, glasswork and other embellishments, is a reflection of the cosmopolitan society which existed in the Voios region until the early 20th century.

Today while many of the structures, including houses, churches, schools and bridges, have been properly conserved and protected, a great many others are left to decay. What is more, much of the knowledge required to restore these structures has disappeared from the region. Geopark Grevena-Kozani collaborates with local preservation and educational efforts to save these structures and archive the knowledge which was developed over many centuries, and which is still relevant to our modern lifestyle and the challenges ahead.

A GROWING INTEREST FOR ICHNOFOSSILS: MEGAFUNA PALEOBURROWS FROM NEOGENE-QUATERNARY

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Giant paleoburrows (Paleotocas) are bioerosion made by Xenarthrans mammals during the Neogene-Quaternary (last 23 million years), known nowadays as geosites of international relevance. Paleotocas are gigantic ichnofossils organized in two species: *Megaichnus major* and *Megaichnus minor*. A recent growth is perceived regarding the studies related to giant paleoburrows, mainly concerning its description and catalog. On Southern Canyons Pathways UNESCO Global Geopark (SCPUGG – in Portuguese Geoparque Mundial da UNESCO Caminhos dos Cânions do Sul), South of Brazil, the Paleotocas compose one of the most visited natural heritage sites. The Geopark proposal provided the means for researchers provide investigations which may lead to the appreciation of the Paleotocas as a geosite, whom can be organized as scientific, educational, touristic and scenic. The scope of present contribution is the visualization of researches related to Paleotoca ichnofossil through time. Thus, key-words “Paleotocas” and “Paleotocas + Megafauna” and its translations to English (i.e. Paleoburrows) and Spanish (i.e. Paleocuevas), were searched on Google Scholar and Scopus databases. Abstracts, full papers, monographies, thesis and dissertations were cataloged. The result showed 50 publications in total. The data analysis showed the volume of publications increased from 2010, peaking in 2022 (graphic1), which is related to the increase of investigations on the SCPUGG. In general, the publications are related to the morphological studies of Xenarthrans, mostly developed by paleontologists on paleontological journals/events. It is distinguished among the conferred publications a lack of researches concerning the special distribution of Paleotocas in order to comprehend its biostratigraphy, whose research is now the subject of first author dissertation, withing the geopark area.

HISTORICAL FOUNTAINS AND ANCIENT SPRINGS: GEOTURISTIC PATHS IN THE MURGE AND PREMURGE AREAS IN SEARCH OF A SUSTAINABLE RESOURCE OF OUR ANCESTORS (PUGLIA, SOUTHERN ITALY)

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Abstract

Geotourism, which is based not only on the geology but also on the respect for the crossed territory, could represent one of the means to achieve some goals of the Sustainable Development Agenda 2030. A geotouristic itinerary is the result of a geological study that can reveal aspects not easily recognizable to an unskilled user, but also the investigation of links between geo-knowledge and other cultural aspects. One of such links is the connection between geology and the ancestral origin of towns, and one of the main factors in choosing the urbanization of an area was the presence of water.

Some towns located in the Murge and Premurge areas (Puglia, Southern Italy) offer a good opportunity to show how the presence of water, still recorded thanks to the existence of historical fountains and ancient spring catchments, is conditioned by regional geology and was important for their development. Taking advantage of this last interest, it could be possible to promote a geotouristic itinerary along some old towns, in particular those ones of Laterza, Gravina in Puglia, Matera, Poggiorsini and Spinazzola.

Murge and Premurge areas that host these towns show a simple geologic anatomy with Cretaceous limestones, forming a substrate made up of topographical ups and downs, covered and /or mantled by Quaternary deposits. The latter ones comprise: coarse-grained calcarenites (Calcarenite di Gravina Fm) vertically and laterally passing to clays (Argille subappennine Fm), in turn capped by sand and gravel. The key position of clays below coarse-grained porous deposits favours the presence of local surface aquifers and several surface springs. Premurgia springs in these rugged and difficult territories were a real resource for the development of local communities in pre-modern times. The “modern” use of water dates back to the Middle Ages, is proved by numerous historical fountains or aqueduct that catch or replace the ancient springs. The occurrence of springs is the main link between the five towns on the geotouristic route, but each location has its own geological features that enhance its geodiversity.

Among the quoted old towns, Laterza, Matera and Gravina in Puglia offer spectacular views on their “gravine”, canyons-like river incisions on whose flanks these rupestrian towns developed digging the Calcarenite di Gravina Fm. Thanks to the link between geology (water, diggable rocks) and anthropization of the area, geotourists can undertake not only a sustainable trip, but also a journey through the man history. In addition, the development of geotourism in these communities could draw greater attention to these historical fountains, and encourage the recovery of waters that are currently not drinkable.

GEOTOURISTIC MAP OF LATERZA (MURGIA MATERANA, SOUTHERN ITALY)

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Geotourism, focused on the geological knowledge, constitutes a useful practice for the valorisation and conservation of natural heritage. In addition to its educational and cultural function, geotourism deseasonalizes visits, thus proposing a new and sustainable offer, in line with the objectives of Agenda 2030. A geotouristic map is a key support to promote sustainable tourism. That one proposed in this study regards the territory of Laterza, a rupestrian town of the Murgia Materana (Southern Italy). The Murgia Materana is a morpho-structural high made up of Cretaceous limestone mantled by Quaternary deposits. The oldest of these Quaternary deposits is the Calcarene di Gravina Fm, an easy diggable soft-rock that allowed the development of the rupestrian old town of Laterza. Caves, cellars, houses, churches, many of the latter preserving also precious frescoes, attract a good number of tourists. Furthermore, these places are located along sub-vertical walls of a deep canyon-like incision (locally named "gravina"). The Gravina of Laterza, up to 200 m deep and almost 15 km long, makes the landscape very appealing and is a spectacular geotouristic attraction. In order to reveal the geology hidden in the landscape, a geotouristic map is under construction and includes the most important routes that cross the study area, a new geotouristic path, the most important outcrop sites, panoramic viewpoints, caves and rock churches entirely excavated in the carbonate soft-rocks. In addition, historical fountains/springs and the way of the existence of their water are also reported. An excellent opportunity presented by this study is the integration of data that characterizes the proposed map into OpenStreetMap, a widely recognized global collaborative mapping project. The organisation of geotouristic information and the outlining of the geological history of the area, linked to the map, represent a necessary step for a geotouristic proposal that makes this area appreciated in all its nuances.

THE ASPIRING DAHAR GEOPARK (TUNISIA): SEVERAL GEOHERITAGE OF INTERNATIONAL INTEREST

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The South East of Tunisia is endowed with a particularly rich natural and cultural heritage. In its capacity as custodian of the country's geological heritage, the National Office of Mines has been committed since 2016 to the establishment of the first geopark in Tunisia: The South-East Tunisia Geopark (DAHAR).

The Aspiring DAHAR Geopark has several geoheritage of very clear international interest, among them:

It is located in the area where 'the great rift' that split Pangea into two, Eurasia and Gondwana and creating the new ocean - the Tethys. The rock formations and geological landscape in this area are evident of these phenomena;

A Land of Dinosaurs, during the Upper Jurassic to Lower Cretaceous (150 to 100 million years), the uplift of land caused several successive and prolong emersion of the Saharan platform. This period saw the accumulation of sandstones, clays and dolomites totaling about 250m in thickness. During this time, theropod (carnivorous) and sauropod (herbivorous) are roaming the Dahar region. The most significant finding is the Tataouinea Hannibalis (an herbivorous dinosaur);

In addition to dinosaurs and various marine fossils that define the uniqueness of the Dahar region, the geological and historical and cultural connections are very striking, especially the construction of Berber villages, the Troglodyte habitats, and the Ksour - Berber fortified granaries.

Regarding the small number of geoparks in African and Arab countries, UNESCO and the GGN have launched an initiative (2021) to assist Africa and the Arab States in implementing such projects, to deploy geoparks globally as a tool for sustainable development. This initiative consists of providing technical assistance and support to the submission of the application to UNESCO. In this context, the National Office of Mines, with its partners, has submitted the application for the Aspiring DAHAR geopark. Among 24 applications, including 16 from Arab and African countries, the Tunisian application was selected (rank 2) in view of the importance of the region's heritage potential (geological and cultural).

Following this successful selection, UNESCO and GGN have designated two experts to oversee the Tunisian dossier. In this context, an advisory mission was organized during the month of August 2022.

THE HIGH ATLAS OF MARRAKECH: A PROJECT TERRITORY FOR AN INSPIRING GEOPARK?

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As part of the scientific project Geopark H2020 RISE aiming at developing a methodology for creating inspiring Geoparks in emerging countries, the High Atlas of Marrakech was chosen as the study area. Several studies were conducted in the Zat valley, emphasizing and justifying its heritage resources in terms of geology, ecology, and culture.

Although the labeling of the Zat mountain territory as an inspiring UNESCO Geopark was not a research objective per se, many local stakeholders and civil society representatives aspired to establish a territorial project for Zat focused on the preservation and enhancement of its various heritage facets and its sustainable territorial development.

The objective of this communication is to provide a status report on Zat in relation to the requirements of the UNESCO Geopark label specifications, pertaining to various factors related to Geodiversity and geological heritage, non-geological heritage, geosites and geozones, Geoeducation and environmental education, Geotourism, local products with added value, etc. This will highlight the issues, limitations, challenges, and opportunities related to the aforementioned labeling of this territory by UNESCO. The analysis will also cover the governance and actor systems that may hinder or be involved in the heritage recognition of Zat.

The adopted methodology fits into a territorial and heritage-based approach, leaning on academic research and results from semi-structured interviews conducted with local, public, private actors, and members of civil society during this same research program "Geopark" H2020 RISE.

**MOROCCAN GEOLOGICAL HERITAGE
EARTH HISTORY MARKER TO NEW LAND RESOURCES
INVOLVEMENT AND INITIATIVE OF THE GEOLOGICAL SURVEY OF MOROCCO**

Ahmed Benlakhdim, *Ministry of Energy Transition and Sustainable Development*

Morocco is a showcase of geology where its different facets, extraordinarily exposed, incarnate the memory of a rich history of the Earth, over three billion years old, in the form of visible witnesses in the basements, soils and landscapes of our country: fossils, minerals, geomorphology, stratigraphy, tectonics, etc.

These elements which constitute the national geological heritage have, due to the geographical situation of our country through geological times, a capital role in the understanding of the geological relations between Africa and Europe and between Africa and America. , allowing in particular the definition of stratotypes (Stratotype of Oued Akrech, Stratotype of Makhfamane) which serve as references for the scientific community and the highlighting of numerous paleontological and mineralogical deposits of exceptional richness.

Alongside mineralogical and fossil specimens, Morocco represents, particularly in its southern regions, a place of discovery of a very large quantity of meteorites, the most spectacular of which is the Martian meteorite of Talsint.

Aware of the importance of the geological heritage, which constitutes an integral part of the national natural heritage, the public authorities are part of the evolution experienced by the protection of the natural heritage both at regional and international level.

As a result, the Ministry of Energy Transition and Sustainable Development, very aware of the importance of this non-renewable good, received to be preserved and passed on to future generations, has placed at the forefront of its strategic orientations, the need to protect it against any deterioration and irreversible loss and contribute to its enhancement.

This presentation traces the geological history of Morocco, the richness of its geological heritage and the measures taken to safeguard and enhance it.

THE MACROINVERTEBRATES OF MGOUNE VALLEY AND THEIR ROLE IN THE AQUATIC ECOSYSTEM

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Macroinvertebrates are an important link in the food chains of surface watercourses, providing essential food for many animals such as fish, birds, frogs and others, as well as participating in the circulation of matter between the aerial and aquatic environments (Jaccobus.2019).

They also play a role as bioindicators of water quality. These macroinvertebrates are characterized by their polluosensitivity and polluoresistance, with some orders being highly polluosensitive, such as the Plecoptera (Dochet et al.2017).

In the Mgone valley, the watercourse is very rich in macroinvertebrates and is the only watercourse in the Drâa basin where we find the Perlidae family represented by the species *Perlabipunctata*. (Benlasri et al.2022). It is a polluosensitive species considered to be a key indicator of the quality of the environment. (Feeley.2009) but unfortunately this species is rare and threatened (Errochdi et al.2014)

The Mgone area is a part of the High Atlas which is considered as endangered «hot-spots », both for the plant biodiversity and the aquatic fauna (Dakki. 2009) that's why the protection and conservation of this ecosystem is important to preserve this specie and the other polluosensitive macroinvertebrates.

KRAS – CARSOGEOPARK CROSS-BORDER COOPERATION AND ACTIVITIES

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The Classical Karst Region, understood as the Kras-Carso plateau, in the 19th century, gave birth to the study of karstology which then developed throughout the Planet. For several years Slovenian and Italian partners have been working together and during the last years, coordinated by the Geological Survey of Autonomous Region of Friuli Venezia Giulia and the Sežana Municipality, they focused on common projects as the one of the Kras-Carsogepark and for the candidacy to the GGN UNESCO network. There are many projects and activities that took place, but in this presentation, we will only talk about the most recent and current ones. The GGN application – the documentation was drafted thanks to a cross-border working group team (composed by scientific professional experts from Universities and Geological Surveys by both sides); a cross-border management plan, an action plan, a marketing plan and the entire candidacy dossier were drafted. In the field of popularization of the geopark and the geological heritage of the Kras-Carso plateau a lot has been done; the work focused on the organization of a course dedicated to nature guides, run, by the researchers of the Mathematics and Geosciences Department of the Trieste University (ITA) and the geologist of the Geological Survey of Slovenia and the Karst research institute IZRK SAZU (SLO). Habilitations were carried out in Italy and Slovenia as well as cross-border. Thanks to the new guides, a traveling exhibition on the geopark was created which is now touring schools. Many geological cross-border paths have been planned, as, for example, the geo-Alpe Adria Trail (a very famous and well-promoted trail linking three nations, Austria, Italy, and Slovenia and passes right inside the geopark's area); QR code tables, with information about the geosites and the geology of the Karst have been placed along the route. The latter are linked to the geopark's cross-border web page, prepared in 4 languages (English, German, Slovene, and Italian). A geopark visitor center was set up at Basovizza near Trieste with a multimedia approach to the interpretation of the geological heritage. The main promotion of the cross-border geopark takes place during two periods of the year; during the week of the geopark (each end of May till the beginning of June) and the week of the Planet Earth, in the week around the geodiversity day (6th of October). The events took place across the border (cycling geo-tours, exhibitions, scientific talks, educational activities, and so on). Thanks to the new strategical Interreg Italia-Slovenia KRAS-CARSO II project we are stronger in both scientific partnerships and tourism operators - this gives us a way to put together science and the dissemination and promotion of the territory. The universities, the geological surveys provide the scientific basis, the tourist bodies the contour that involves local economic operators (always on the principle of consumption of local geo-products) contribute with the involvement of the local population. Much importance is also given to the cultural heritage that is strongly related to stone and geology. The Classical Karst has a peculiar morphology that affects local life and settlements. Barren stones and the absence of surface waters characterize the natural and anthropic landscapes. Walking through the Classical Karst it's not rare to face with historical buildings, houses with stone roofs, and natural heritages. In fact, massive and platy limestones have been and are still used for building purposes not only in these territories but have been exported all over the world. A peculiarity of this territory is the Timavo-Reka aquifer system. Studied since the Romans, it perfectly connects the territory from Slovenia to Italy in a single whole. Numerous geosites are linked to this water body and, in particular, the UNESCO Site of Škocjan Caves which, since 2022, has been also recognized within the first 100 geosites in the world. At last but not least, for the presentation of the geopark area and the common work, thanks to the collaboration between cross-border partners and external experts, the book "The Classical Karst geopark" was printed and is available at this link: <https://2014-2020.ita-slo.eu/sites/default/files/allegati/ANG.pdf>

A book that, thanks to the results of over two hundred years of scientific studies and speleological explorations, illustrates the unique geology, geodiversity, natural environment, and the rich cultural heritage of this area. And, at the same time, considers the cross-border geological and territorial resources of the Karst plateau as a unique, from the point of view of geoparks, as an element that encapsulates its identity for the local community and which can be considered a tool for sustainable development.

THE FLAVORS OF THE TABLE MOUNTAIN LANDSCAPE - A PROJECT TO SPREAD KNOWLEDGE THROUGH TASTE

Anna Bergengren

PlatåbergensUGGp is located in Western Sweden and was designated as Sweden's first UNESCO Global Geopark in 2022. The geopark aims to strengthen the identity of the area, instill a sense of pride in the local population for their surroundings, and attract visitors to discover the fascinating history of the plateau mountain landscape. The geopark covers nine municipalities and an area of 3690 km². We have received a total of 1.8 million euros in EU funding from the Rural Development Program (through the Swedish Board of Agriculture) to create culinary experiences and unique products related to the natural and cultural heritage of the plateau mountain landscape over a period of two years, starting on January 1, 2023. What does limestone or diabase taste like? What ingredients are associated with the different types of rocks found in the plateau mountains? Do the different mountains have their own flavor profiles? The Table Mountains should be experienced through all the senses: sight, hearing, touch, smell, and taste. By using ingredients and processed products from the geographically defined area, we enhance understanding and knowledge about the plateau mountains. The regional conditions and the area's unique natural and cultural heritage provide authentic experiences and products that are an important step in the development of a sustainable tourism industry. Our hope is that through flavors and food, we can benefit local producers in our area and create a distinct profile for products originating from the plateau mountain landscape and the different mountains within our area. We will work on developing examples of products, including ingredients, food, and experiences.

TATA ASPIRING UNESCO GLOBAL GEOPARK: INTERNATIONAL DESIGNATION FOR SUSTAINABLE REGIONAL ECONOMIC DEVELOPMENT (WESTERN ANTI-ATLAS, SOUTH MOROCCO)

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Tata aspiring UNESCO Global Geopark is a new project located in South Morocco in the Western Anti-Atlas, part of the mobile belt of the West African Craton. This is a promising project, given the importance of this type of initiative in sustainable development. It is a territory that hosts an immense geological and geomorphological diversity, capable enough to attract more attention and curiosity, from specialists and tourists. The territory of the future geopark is made up of land ranging in age from Paleoproterozoic (2200-2030 Ma) to Quaternary, affected by several successively Eburnean, Pan-African, Hercynian and Alpine orogenies, with a specificity of Hercynian orogeny. The tightening is of variable intensity and multidirectional because of the Precambrian promontory already cratonized and cut into blocks with different geometries, and which do not respond in the same way to the compressive stresses of shortening. The plicative deformation of the Paleozoic cover obeys the behavior of the underlying basement in a non-homogeneous way, hence the very varied style of folding from one zone to another. These fields, affected by several geodynamic events, have been exposed to long periods of erosion, adding to climate hostility to make the geology and geomorphology easier to read and more fascinating to contemplate, compared to other domains of Morocco.

In addition to the geological potential, the territory is very rich in natural heritage (Site of Biological and Ecological Interest of AitOumribt) and cultural (tangible and intangible), making it a privileged and unique place. The mix of heritage of the future Tata Geopark is the key to developing the territory and increasing its attractiveness to the population, visitors and entrepreneurs. Tata aspiring UNESCO Global Geopark is a project that could be a valuable addition to the Global Geopark Network, but also a lever for sustainable development in this area. Its promotion could be an important alternative that might take this oasis region out of the current marginalization, diversify the income of the populations and reduce their pressure on the environment. A geopark will be a new scientific, cultural and educational approach and an investment for tourism and socio-economic development in this area.

The governance of the Tata aspiring Geopark is ensured by the Tata Geopark Association, created in 2022 specifically for the creation of a geopark in the province of Tata. It is responsible for the day-to-day management of the administrative and field affairs of the geopark. This management committee will be guided by a steering committee and supported by a scientific committee, while the technical committee will be responsible for the implementation of actions in the field.

LATIN AMERICAN CARIBBEAN GEOPARKS NETWORK GEOLAC NETWORK: PROGRESS AND CHALLENGES.

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Abstract

The GEOLAC Network, since its creation in 2017, has placed emphasis on building and strengthening the network based on the UNESCO Geosciences and Geoparks Program, and the definitions of the Global Geoparks Network (GGN), with the objective to contribute to the Sustainable Development Goals (SDGs), pillars of the long-term strategic agenda.

Our challenges in recent years have focused on maintaining an active work schedule to advance participatory planning linked to the GGN Strategic Plan. In the Conference held in the month of November 2022 in the Imbabura Global Geopark, the formation of the working groups that can propose actions to respond to management challenges and promote their sustainability in the territories is approved, in which four working groups (Gender, Indigenous Peoples, Education and Geotourism) and two transversal groups, the group from the magazine Geoexperiences and the Communication and Dissemination group.

In the last Conference of the Geolac Network, the activation of the working groups was agreed (2023-2024 work agenda), through the realization of: Regional training workshops for Geoparks projects (Geolac Network–PIGG Montevideo UNESCO Office). Design an internship program. Generation of a bank of projects between Geoparks territories of Latin America. Other networks and institutions. Strengthen a Communication Plan. Updating web information. Continuity in the publication of the Geoexperiences Magazine. Celebrate, as Red GeoLAC, International days such as the day of the Original Peoples, the day of Geodiversity, the day of risks and disasters and the day of Geotourism.

The Network will continue to strengthen the work based on the principles of the Geoparks "From the bottom up" with the active participation of those who lead processes in the territories, and likewise improve knowledge management.

THE DARK SKY OF CAUSSES DU QUERCY UGG: 15 YEARS OF ACTION

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In 2002, the national magazine "Ciel et Espaces" (Sky and Space) published a map of the quality of the night sky in France. This led to the identification of the "black triangle of Quercy" in the Causses du Quercy Geopark. It is characterized by the exceptional quality of the sky, which is preserved from light pollution, something that is quite rare at such a low altitude (300-400 m). This new asset for the territory would take a few years before all the stakeholders took ownership of it and got involved.

The first steps were taken to equip the Geopark's partner tourist accommodations by providing them with a telescope and offering them training in astronomy, sky observation, and telescope use.

Since 2009, local authorities have been taking part in the national "Night Day" event. Initially, only one municipality took part. Today, more than 50 municipalities are offering activities.

The next step is to put in place a policy to support local authorities in switching off their public lighting. By 2023, 67 of the Geopark's 95 municipalities will have switched off, all or part, of their street lighting after 11 pm. Of these, 32 have been awarded the national "Starry Towns and Villages" label. These extinctions help to maintain nocturnal biodiversity: artificial light disturbs migratory birds and flying insects and disrupts the biological rhythms and reproduction cycles of many species.

Other actions are also being taken:

- Renovation of urban lighting to limit light pollution.
- Development of the "Trame noire" (dark corridor) to create ecological corridors to protect nocturnal biodiversity from light pollution.
- Training for accommodation and educational staff.
- Creation of awareness-raising tools: an exhibition and booklet on the night.
- Setting up an educational program with schools.
- Setting up sky observation sites with observation tables and furniture.
- Sky-watching activities organized by Geopark partners.
- Organization of 2 "Night Festival" events.

These activities enable visitors to observe the starry sky all year round and discover the celestial heritage while preserving the nocturnal biodiversity of the Causses du Quercy Geopark.

POLITICS OF POST-DISASTER IMPACT ASSESSMENT IN INDIAN SUBCONTINENT WITH SPECIAL REFERENCE TO INDIA

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Disaster defined as catastrophic situation in which the normal pattern of life or eco system has been disrupted and extraordinary interventions are required to save and preserve lives and or the environment (Ministry of Home Affairs, Govt. of India, 2011). The Indian subcontinent is highly vulnerable to cyclone, droughts, earthquakes, floods. Huge population of the region and the unplanned urbanization have forced people of subcontinent to live on marginal lands or in coastal areas. The natural disaster directly impacts economy, agriculture, food security, water, sanitation, the environment and health. The subcontinent always witnesses politics of post disaster impact assessment. In India, post-disaster impact assessment is always been politically motivated. Same scenario is also being seen in Bangladesh and Sri Lanka also. Political parties of the region are always playing political card at the time of impact assessment and at the time of distribution of aids. In this situation real scenario of damages and losses are not accounted accurately and affected people are losing which they deserve. Reconstruction is not going in right direction due to nasty politics. In the recent past, coastal regions of India and Bangladesh had been badly affected by some of the strongest cyclones like 'Aila', 'Fani'. And 'Amphan'. Due to these devastating cyclones the coastal regions of India and Bangladesh are badly affected due to huge loss of human life, domestic animals and huge amount of property. But the political parties of both the countries engaged in nasty politics at the time of assessment, distribution of rehabilitation and reconstruction of the region. So, the aim of the paper is to analyse the importance of post-disaster impact assessment and the politics of impact assessment, rehabilitation and reconstruction.

GEOTURISTIC GUIDE: "ON THE TRAIL OF THE POLLINO LINE"

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Within the context of the "FESR BASILICATA 2014-2020 INNGREENPAF financing, one of the projects financed by the Region of Basilicata was "From Park to UNESCO Geopark: new models for the protection and sustainable development of the territory" The project and its proposals were elaborated with the aim of converting the research activity conducted as part of the recognition of the Pollino UNESCO Global Geopark, into informative activity, which is indispensable in the development and implementation of new forms of tourism. From this perspective, to add to the numerous similar activities that already take place in the Geopark, we wished to develop a project that included the realisation of two geological-tourist guides (On the Trail of the Pollino Line and Ancient Tethys Ocean), a dedicated information board and a highly emotive video, "Pollino: a window on the history of the earth", which would propose to the park visitors a series of geo-tourist itineraries and a highly informative representation of the geological origins of the Park territory and its environmental, human and historical peculiarities. The two guides in particular are to be added to the series of publications that have been produced as part of the strategy adopted to gain recognition as a Geopark and describe, through detailed tourist itineraries, the main geological peculiarities and the spectacular landscapes which it has produced. The itinerary is described through a series of stops, some of which are furnished with specific, detailed information boards which permit the geological-landscape evolution of much of the Pollino GeoPark to be better understood.

THE MUD FORMATION IN THE AREA OF XI OF KEFALONIA ITHACA UGGP: TESTING ITS SUITABILITY FOR MUD THERAPY, AS A TOOL OF SUSTAINABLE TOURISM

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Abstract

Muds are commonly used in mud therapy due to their beneficial properties for health. A systematic geological study of the southern part of Paliki peninsula (Xi beach, Koutala beach, Chavdata and Mantzavinata regions) of Kefalonia Ithaca UGGp, where extensive and thick mud deposits are found, was carried out (Figure 1). The study concerns the mapping of the lithological formations, the determination of their age and environmental conditions of their deposition using micropaleontological methods. Subsequently, systematic sampling of these sediments was carried out and application of sedimentological and analytical geochemical methods aimed at determining their granulometric composition, their mineralogical and geochemical composition including composition in clay minerals, determination of their pH, plasticity, percentage of organic matter and origin of organic matter.



Figure 1. a) google earth map showing with arrowsthe studied areas and withcirclespositionsof possibleexploitation, b) Koutala beach with its red sand and the grey mud outcrops.

In addition, it will be possible to understand better the depositional mechanism of these muds with their medicinal properties, as well as the general geological evolution of the area. In particular, two are the objectives of this project: 1. The construction of mud therapy spa units by attracting local investors or municipal interest, 2. The construction of a processing - production - standardization - certification unit and finally the sale of various products suitable for mud therapy at home. It is obvious that an effort will be made to exploit mud material from a landward, and not from protected areas. Among the expected results are the economical and touristic strengthening of the Kefalonia Ithaca UGGp, as well as its sustainable development.

THE M'GOUN UNESCO GLOBAL GEOPARK (MOROCCO): SCIENTIFIC AND CULTURAL POTENTIAL

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The M'Goun Geopark, labeled and integrated into the Global Geopark UNESCO in 2014 and in 2018 is located in the middle of the central High Atlas chain of Azilal-Demnate. The M'Goun Geopark is presented in a series of reliefs at often high altitude; the main massifs are Ighil M'Goun (4,068 m) and Azourki (3,690 m). The geological history of the territory of the M'Goun geopark is integrated into the geological evolution of the central High Atlas which dates back to the time of the Triassic rifting, 250 million years ago, but the main phases of bio-sedimentary fillings took place during the Jurassic period (from 200 to 160 million years ago), the alternations of marine carbonate deposits and continental red layers testify to strong eustatic marine oscillations. In the Cretaceous, the generalized laguno-continental sedimentation is momentarily interrupted by 2 sudden marine incursions, one in the Aptian, the other in the Cenomano-Turonian, before the withdrawal of the sea from these high-Atlasic regions at the end of the Cretaceous (around 60 million years ago). The structuring in anticlinal wrinkles and synclinal basins is realized during the tightening and the compression of the Neogene and particularly in the Miocene, 10 million years ago.

The M'Goun geopark is a privileged territory because of:

geological structures inscribed in an intra-continental NE-SW chain resulting from a structural inversion of a basin essentially Jurassic related to the approach of the two plates Africa and Europe;
the quality of the outcrops, the landscapes and the diversity of the sedimentary facies;
the famous and spectacular footprints of sauropod and theropod dinosaurs and the numerous bone deposits, in particular, the one that provided the almost complete skeleton of the famous sauropod *Brachiosauridae* named *Atlasaurus imelakei*;
the presence of geological maps at 1/100.000 and a geological guide "The dinosaur road" which cover almost the entire M'Goun geopark and which allow to follow and appreciate the geology, along the various regional routes and circuits;
the Azilal museum where the natural, archaeological and cultural heritage of the geopark territory will be exhibited.

The territory of the M'Goun geopark contains a geological, natural, architectural and cultural heritage of great value. The study, protection and development of the territory is part of an integrated development strategy led by the administrative authorities (wilaya of Beni Mellal and province of Azilal), the region of Beni Mellal Khenifra, and the Management Association of the M'Goun geopark (AGM).

**GEOROUTES AS A TOOL OF GÉOSITES VALORISATION IN BENI MELLAL ATLAS MOUNTAIN
(NORTHWESTERN PART OF THE NATIONAL M'GOUN GEOPARK, MOROCCO).**

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Georoutes are essential touristic tools for disseminating and valorising geoheritage because they work as outdoor field classrooms where visitors learn about geological and geomorphological sites and phenomena. Geographically, Beni Mellal Atlas is the mountain belt situated at the Middle Atlas- High Atlas Mountains junction and belongs to the Beni Mellal province in the Beni Mellal-Khenifra region. The Beni Mellal Atlas chain belt contains many sites with high geological and geomorphological values, uniqueness, integrity and beauty and has excellent potential for tourism development. They are essential for understanding the geological and geomorphological history of this part of the Atlas Mountains and therefore deserve to be valorised and safeguarded. However, the tourism potential of this geological and geomorphological richness is generally unknown to the general public and overshadowed by local actors. According to the inventory and classification results, numerous sites were studied, and they result from geological processes such as magmatic, sedimentary and structural phenomena as well as geomorphological processes, mainly fluvial, karstic and speleological. This work details a georoutes in three stages connecting these geosites and geomorphosites of Beni Mellal Atlas to show all aspects of the geodiversity of this mountain range. The proposed georoute highlights the geological, geomorphological heritage and abiotic landscapes and other categories of heritage mainly cultural sites. It is a new touristic offer that could contribute to socio-economic development and the creation of additional jobs for local associations and communities of these mountain areas.

GEOLOGICAL LINKS TO LANDSCAPE AND ITS USE AS AN ECONOMIC DRIVER IN SUSTAINABLE AND REGENERATIVE TOURISM FOR THE OUTDOOR ADVENTURE & ACTIVITY SECTOR.

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People have inhabited the Mourne Gullion Strangford UNESCO Global Geopark (UGG) since just after the end of the last Ice Age, their lives have been shaped by the unique landscape and its underlying geology. In the same way, they have shaped the land with agriculture and industry. The breath-taking landscape of Mourne Gullion Strangford UGG is used for a wide range of outdoor adventure and activity businesses and enthusiasts. The case study is the outdoor adventure and activity businesses programme which has provided support for the identification of a number of businesses and other partners to unite and use the local landscape and regional geology to co-create innovative, interactive new tourism offerings that will convey a real 'sense of place' to our visitors. The project brought together outdoor adventure and activity small and medium-sized enterprises (SMEs) and partners in the tourism sector to harness the potential economic, social and environmental benefits that can be realised from collaborative working. Outdoor adventure and activity visitor experiences also support other tourism products such as Landscape, Food and Drink, Health & Wellbeing, Heritage and Myths & Legends. The programme participants define their current sustainable/regenerative tourism practices and their vision with the output replicated through other sectors such as Food/drink experience providers, Culture/heritage experience providers, Outdoor activity/adventure experience provider, Wellness experience providers. The purpose of this approach is to empower a ground-up movement whereby providers use their own language to provide guidance to their local community, visitors and their teams; encourage providers to independently engage in sustainable/regenerative tourism practices and to have the confidence to communicate what they are doing well along with their goals/aims for the future; are placed at the centre of Mourne Gullion Strangford UGG sustainable/regenerative tourism ethos/approach – i.e., making it clear that they are key custodians of their homeplace which they have a responsibility to safeguard and support; are encouraged to proceed according to a stand-up and lean approach. i.e., having the confidence to stand up and promote their practices while leaning on support resources e.g., offered by UNESCO, Local Authority, National Tourism Bodies etc.

THE RISE AND FALL OF THE CALEDONIAN MOUNTAIN RANGE IN THE FJORD COAST REGIONAL - AND GEOPARK

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The Fjord Coast Regional and Geopark is located at the mouth of the majestic Sognefjord, and spans across five municipalities along Norway's western coast. It is home to a community of 9,400 people, spread over approximately 2,750 square kilometres, with a stunning variety of natural and topographical wonders. The areas encompass islands and fjords, forests and waterfalls, as well as alpine mountains and Scandinavia's lowest lying glacier. Among these elements, one can discover coastal heathlands clinging to islands and reefs, which are important grazing areas for wild sheep. This is part of a several-thousand-year-old agricultural tradition of heather management, by burning to provide better pastures for free-range sheep. Several of these areas are considered of national interest or preserved territories.

The geological composition of the Fjord Coast Regional and Geopark presents an extraordinary chronicle that stretches from the roots to the peak of the immense, ancient mountain chain, the Scandinavian Caledonides, which is believed to have been as tall as today's Himalayas. This happened due to a collision between the continents Laurentia and Baltica approximately 400 million years ago.

Situated on the Baltic side, the Park encompasses a segment of the Caledonides that retains its most critical elements, displayed strikingly across superb localities within a confined geographical expanse. This includes 1) Multiple lenses of eclogite and kyanite-mica-schist deposits, that bear a testimony to the Baltica basement's subduction to great depths under Laurentia. 2) Massive thrust sheets, comprised of Laurentian rocks or oceanic crusts exhibiting pillow lava, and in certain locations overlay the accretionary wedges, all positioned over the Baltic craton. 3) The extension of the crust, coupled with the collapse, created basins, high up in the mountain range, that was filled with erosion material. This collapse formed the Solund and Kvamshesten Devonian Basin.

Now, the geopark brilliantly illuminates how age-old rocks have been masterfully sculpted over time into today's coastal, fjord, and mountainous landscape.

The geological make-up of the geopark has traditionally provided a wealth of opportunities for local inhabitants. The production of millstones in Hyllestad became noteworthy as far back as the 700s, and the extraction of copper from the upthrust oceanic crust in Askvoll around 300 years ago are merely two of numerous instances illustrating the area's utilization of its geology.

Following deglaciation, early settlers began to clear forests using axes, fire, and grazing animals, creating what we now know as coastal heath. This unique habitat, only found along the coast, owes its existence to a mild climate that allows for year-round outdoor grazing. These ancient farming traditions, involving controlled heather burning and free-roaming sheep, had almost vanished entirely. However, a recent surge in local understanding of the significant interplay between landscape and culture has led to a revival of these practices. The locals have decided to renew the breeding of the Old Norwegian Sheep, a breed genetically identical to that used by the Vikings a thousand years ago and perfectly adapted to the natural coastal climate.

Controlled burning and grazing not only manage the landscape but also increase biodiversity, providing a protective barrier for local flora, fauna, birds, and insects.

LINKING COMMUNITY PRIDE TO TOURISM DEVELOPMENT IN UNESCO GLOBAL GEOPARKS

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We know that the prestige of a UNESCO designation can direct tourism to Geoparks and therefore support and drive sustainable development in that sector. But how to mitigate the challenges for rural and sometimes remote areas, encourage people to visit and invest, and to do so in a way that is not destructive but rather celebratory and complimentary to the region's Geoheritage?

It makes sense that in the Tourism sector, much emphasis is placed on encouraging visitors from away; however, the work needs to start with the residents themselves. Too often we take for granted what is in our own backyard, and we forget to nurture, grow and promote it. Geoparks therefore play an essential role in encouraging pride of place and community development where tourism is concerned. It is a sense of patriotism for your Geopark region itself. Having a sense of pride and ownership of where and what you come from, and how the land has shaped that, leads to a drive to invest in your own future, education and community. We must believe fully in what we are promoting, because investment in yourself leads to investment in your community, which in turn drives others to further appreciate, learn about and visit the area as well.

JADE'S DESIGNATION AS NIIGATA PREFECTURE'S OFFICIAL STONE: OPPORTUNITIES AND CHALLENGES FOR ITOIGAWA GEOPARK

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Abstract

The color, texture, luster, and strength of jadeite have long held the fascination of cultures from Mesoamerica to the Far East. Located in Japan's Niigata Prefecture, the area which is now designated as Itoigawa UNESCO Global Geopark was once a major center of jade manufacturing and trade beginning in the Early Jōmon Period (approx. 5,000 BC). During this time, beads, pendants, axes, and other items produced from Itoigawa's jade were traded across the Japanese Islands and even as far as the Korean Peninsula. These artifacts are believed to have held great spiritual significance to the ancestors of modern-day Japanese. In addition to its role in Japan's cultural history, Itoigawa's jade is an important part of the region's geological history, having formed over 500 million years ago along a subducting plate boundary.

In recognition of its remarkable aesthetic, cultural, and scientific value, the Niigata Prefectural Assembly adopted jade as the prefecture's official stone on 4 November 2022. While many prefectures throughout Japan have officially designated trees, flowers, birds, and similar symbols, this is the first time a stone has received such an official recognition. The impetus behind this designation was a signature-collecting campaign conducted by a local citizens' group. Supported by Itoigawa Geopark and the Fossa Magna Museum, this grassroots campaign gathered over 40,000 signatures from residents throughout the prefecture.

Jade's elevation to an official symbol of Niigata Prefecture and its people offers new opportunities for Itoigawa Geopark to promote sustainable tourism and earth science popularization while introducing Geopark concepts and ideals to a wider audience. On the other hand, the high aesthetic and monetary value of jade as a gemstone make its conservation particularly demanding, and further promotion risks the degradation of the region's important geological heritage. This presentation will explore these implications and introduce efforts being made for the popularization and conservation of this precious geological heritage.

GEPARKS, SUSTAINABLE TOURISM, AND LOCAL DEVELOPMENT: A CASE STUDY OF GEPARK CILETUH SUKABUMI

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Geoparks have emerged as powerful tools for conservation, education, and sustainable development, integrating geological heritage preservation with local community empowerment. This abstract explores the case of Geopark Ciletuh Sukabumi, focusing on the theme of sustainable tourism and its impact on local development. The Geopark, located in Sukabumi, Indonesia, exemplifies the successful integration of geological and natural wonders with responsible tourism practices. Geopark Ciletuh Sukabumi serves as a model for promoting sustainable tourism that respects the environment and nurtures the local community. The preservation of geodiversity and biodiversity is at the core of its mission, emphasizing the importance of safeguarding unique geological features, flora, and fauna. Through collaboration with stakeholders, the Geopark implements measures to conserve natural resources, manage waste, and protect sensitive ecosystems.

The Geopark's sustainable tourism initiatives are closely linked to local development. By fostering community involvement and providing economic opportunities, it has empowered the local population and improved their livelihoods. The Geopark has created partnerships with local businesses, enabling them to showcase their products and services to visitors. This approach has resulted in increased income for the community and a boost to the local economy. Education plays a vital role in Geopark Ciletuh Sukabumi's sustainable tourism strategy. Efforts have been made to simplify scientific knowledge and make it accessible to the general public, enabling visitors to appreciate the geological wonders and understand the importance of conservation. Educational programs, guided tours, and interactive exhibits contribute to raising awareness and fostering a sense of responsibility towards the environment.

Challenges have emerged along the way, including balancing tourism growth with environmental protection and addressing the needs and aspirations of the local community. However, through shared experiences and cooperation with other Geoparks, Geopark Ciletuh Sukabumi has been able to navigate these challenges and build a sustainable tourism model that prioritizes the well-being of both the natural environment and the local inhabitants. This abstract presents Geopark Ciletuh Sukabumi as a successful example of how geoparks can effectively integrate sustainable tourism with local development. The case study highlights the positive impact on the community, including increased income, preservation of cultural heritage, and enhanced empowerment of the local population. Furthermore, the Geopark's efforts align with the sustainable development goals (SDGs) set by the United Nations, contributing to the achievement of targets related to environmental conservation, economic growth, and community well-being.

In conclusion, Geopark Ciletuh Sukabumi exemplifies the potential of geoparks to promote sustainable tourism while simultaneously driving local development. By valuing geodiversity, preserving cultural heritage, and empowering the community, this case study demonstrates the positive outcomes that can arise when geological conservation and responsible tourism practices are integrated. The experiences and lessons learned from Geopark Ciletuh Sukabumi can serve as valuable guidance for other geoparks seeking to achieve a harmonious balance between environmental preservation, economic growth, and community engagement.

CO-MANAGEMENT OF GEOFOREST PARKS IN LANGKAWI UNESCO GLOBAL GEOPARK: A MODEL FOR SUSTAINABLE TOURISM

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Langkawi UNESCO Global Geopark in Malaysia has three geoforest parks that require effective management to ensure conservation and sustainable development are taken placed the co-management model, involves a collaborative approach with local communities, government agencies, and non-government organization. This creates a sense of ownership and responsibility among community, ensures equitable sharing of tourism benefits, and incorporates local knowledge into park management. The management plan includes measures such as clear boundary, zoning, visitor management, waste management, and community-based conservation initiatives to protect the parks' resources and at the same time promote sustainable tourism. This paper will discuss the co-management model's successes, challenges, and potential as a sustainable tourism development model for other geotourism destinations, highlighting the importance of community participation and collaboration in geoforest park management.

UGGP RIES KIDS' TRAIL IN THE ADVENTURE GEOTOPES DAITING: APPEALING TO THE NEXT GENERATION WITH A MESSAGE OF NATURE PRESERVATION

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The UNESCO Global Geopark Ries is looking to the future with an important contribution to the present: The Kids' Trail at the UGGp Ries Adventure Geotopes Daiting is located in a former quarry reclaimed in the program "From Wound in the Landscape to Nature Paradise" in cooperation with the Heide Allianz.

With the Kids' Trail, the UGGp Ries reaches the next generation to impart the importance of sustainable development and nature preservation through educational, engaging, and understandable information. UGGp Ries mascots Suevie and Riesie lead the way along the nature trail and entertainingly explain the geology, natural and settlement history, plus important safety and conservation behavior, with games, quiz questions, and riddles.

Info-panels topics include: geological history, especially the meteorite impact that formed the Ries landscape (crater and rock debris); fossilization (e.g., Archaeopteryx); settlement history (from Celts to the Middle Ages); natural resources (iron ore to iron); protected natural areas (dry grasslands maintained by migratory sheepherding); flora and fauna (oak forest with animals inhabiting every level).

The Adventure Geotope Daiting "Iron Ore and Limestone" is part of the nature conservation project "Quarrying sites in Donau-Ries—from wounds in the landscape to nature paradises" developed by the UGGp Ries and the Heide-Allianz Donau-Ries. The Heide-Allianz is dedicated to preserving and restoring the nutrient-poor grasslands characteristic of the region. Heath landscapes provide habitat for primary colonizers, are home to a wide range of rare animal and plant species, and play an important role in the biotope system. Dry grasslands—maintained by sheepherding—are important for regional identity and tourism.

In the area of the UGGp Ries, where many different rocks were brought to the surface or newly created by the meteorite impact, excavation sites are particularly diverse. The Heide Allianz works to enlarge the dry grassland network, preserve biodiversity, foster cooperation between authorities and shepherds, assist in landscape maintenance measures, and serve as a permanent contact point in matters regarding dry grasslands and sheepherding.

The Kids' Trail in the Adventure Geotopes Daiting is focused on the future – introducing the younger generation to the principles of sustainability and nature protection – while its location in a reclaimed quarry is itself a contribution to the region's nature preservation today.

HIKING THE PERIMETER OF THE METEORITE CRATER ON THE UGGP RIES PANORAMA TRAIL

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The first stage starts at Harburg Castle and follows idyllic paths to the Old Town of Wemding. The route leads over species-rich dry grasslands to the Geotope Kalvarienberg- Gosheim explaining the geology of the eastern crater rim. A woodland-experience path enchants with information about the Wemding forest.

The second stage begins in Wemding's moat and follows the eastern crater rim past the Polsingen outcrop with impact-melt breccia. One of Bavaria's 100 best geosites, a Ries- lake limestone exposure in Hainsfarth, is a short detour. The stage ends in the princely residence town of Oettingen. From there, with elevated views over the Wörnitz valley, the third stage features fields and meadows alternating with heaths grazed by flocks of sheep, traditional meadow-orchards, woods, field margins, and hedgerows.

The fourth stage passes chapels and picturesque natural highlights. The fifth stage leads through nature preserves, and on the sixth stage, you hike in the footsteps of history to Mönchsdeggingen. The seventh stage leads along the southern crater rim, through beautiful forests and ends at the starting point in Harburg.

Hiking is perhaps the most sustainable tourism activity, and the Geopark Ries is a wonderful place to hike. The Ries Panorama Trail is just one in an extensive system that reveals the charm of this extraordinary landscape: lush vegetation in the crater basin and sparse heath landscape on the crater edge. Each themed trail is marked with directional signs and info-panels that explain the unique Ries landscape and link geology, settlement history, and natural-history features. The free booklets "Hiking in the Geopark Ries" and "Hiking the Ries Panorama Trail" provide additional information. Hiking is the best way to experience the Ries Crater up-close, personal, and sustainable.

THE ASPIRING JERSEY ISLAND GEOPARK

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Jersey is a small Island, 15 km long and 8km wide, located in the Bay of St Malo in the south of the English Channel. The Island's position has created a unique convergence of culture influenced by a dynamic history shaped by Jersey's landscapes and seascapes. Today, Jersey is home to approximately 103,2673 people and is a window into Quaternary (the last 2.6 Ma), Lower Palaeozoic (c. 252 to 419 Ma), and Precambrian (> 541 Ma) geological environments. The surrounding islets, stacks, offshore reefs, and neighboring Channel Islands belong to Armorica. The Channel Islands belong, geologically, to the pre-Palaeozoic and Palaeozoic geology of this province, which differs fundamentally from that of the Cornubian massif of Britain as a result of paleogeographical separation*.

Aspiring Jersey Island Geopark is helping to preserve the Island's exceptional heritages, especially the geoheritage, by proposing an endogenous local economic development, in particular through geotourism.

Jersey's geodiversity plays an important part in the Island's story: the fissures in the rocks at La Cotte de St Brelade enable Ice Age researchers to find evidence of Neanderthals; the development of quarrying through the ages; the rocks used to build passage graves, churches, and historic defenses; the intertidal reefs holding undiscovered geoarchaeology; the evolution of the Island's terrestrial and marine environments, home to insular and endemic species; and the distinctive Jèrriais language, stories, and food contributing to a unique intangible heritage.

**Kendall, R, et al. 2020. Geodiversity Audit for Jersey. British Geological Survey.*

MANAGEMENT OF GEODIVERSITY AND GEOSYSTEM SERVICES IN GEOPARKS: A CASE STUDY OF THE CHABLAIS UNESCO GLOBAL GEOPARK, FRANCE

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This study assesses the effects of human activities and natural processes on geodiversity and geosystem services in Geoparks through the use of the Drivers-Pressures-State-Impact-Response (DPSIR) framework. Geoparks are places that have been set aside with the intention of preserving, managing, and promoting geological heritage and the accompanying natural and cultural aspects. This study concentrates on evaluating the abiotic ecosystem services that geodiversity offers, such as the quantity and quality of water, terrestrial processes, etc.

We applied the DPSIR framework in two geosites, Lake Montriond and Lake Vallon, located in Chablais UNESCO Global Geopark in France. In the past, due to slope instability these two alpine lakes were formed within Pleistocene glaciated valleys. They are categorized as dynamic oligotrophic lakes that have been landslide-dammed. While the region's geodiversity is still not fully understood, the biodiversity of the area has been extensively investigated and carefully managed. Our aim is to increase knowledge in order to make a better assessment of the natural and human factors that are putting pressure on the state of the environment and could have an impact on geodiversity and geosystem services. According to our investigation, these geosites offer crucial geosystem services. Moreover, these geodiversity and geosystem services are significantly impacted by human activities like tourism, leisure, and resource extraction as well as by natural phenomena like climate change and dynamic processes.

The results of this study include the geosystem services maps and DPSIR assessment tables that can help the appropriate administrative authorities to build the right management strategies and solutions to meet these challenges. These can include geosystem services monitoring and assessment, water management, sustainable tourism development, restoring and rehabilitating degraded landscapes, and so on. We argue that a thorough understanding of the intricate relationships between human actions, natural processes, and the geodiversity and geosystems themselves is necessary for the effective management of geodiversity and geosystem services in Geoparks.

This study emphasizes the value of the DPSIR framework as a tool for raising awareness of geodiversity, providing policymakers, managers, and stakeholders with useful advice, and advancing sustainable development and conservation in Geoparks.

THE CYCLE PATH CAMPOTENESE – MORANO CALABRO IN THE POLLINO UGGP

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Pollino National Park/Pollino UNESCO Global Geopark

In 2021, in the PollinoUGGp, a new cycle path was built, starting from Campotenese station to MoranoCalabro station, following the route of the ancient railway Spezzano Albanese Terme-Castrovillari-Lagonegro, commonly known as the Calabro-Lucana railway. The railway, built in the early 1900s, worked until 1978 when it was definitively closed, due to geological problems and to the competition of the road transport services. After these years of abandon, the park authority in 2020 gained a fund from Calabria regional government consisting of about 3.300.000 Euro coming from the EU, aiming to transform this railway, in the section Campotenese – MoranoCalabro, into a cycle path. The Campotenese plain is a strategic area of the geopark because it is the junction point of the two great mountain chains of the Geopark (the Pollino and Orsomarso mountain chains). In addition, it is also important for the presence of the motorway exit and for the access to some important georoutes, geosites, and to the trail network of the park. Here is located also an important tourist reception center of the park. The path is long about 12,650 km with a difference in altitude of 473 m asl, with a maximum slope less than 6%, that makes it suitable for cycling use. The works have interested:

- the building of the pathway;
- the installation of the safety railing;
- the remodeling of the tunnels and bridges;
- information panels and furniture.

Even if it's a single section, the park is working to extend the remodeling of the railway to the whole route from Lagonegro to Spezzano Albanese, with the goal to realize an important work to visit the territory of the park in the frame of slow and sustainable tourism. In fact, the park has already some funds to remodel other sections and some old facilities present along the route, like buildings (waiting rooms, ticket offices), stations, water tanks, etc.

EXPLORING NATURE SHIDDEN BIODIVERSITY WITH BASECAMP RESEARCH IN POLLINO UNESCO GLOBAL GEOPARK

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Microbes play a crucial role in sustaining life and are indispensable for the well-being of our planet and its economy. Microbial functions that exist below ground play a major role in the macro-scale processes such as the carbon cycle, nutrient cycling, and organic matter decomposition. It is estimated that Earth is home to 1 trillion microbial species, yet less than 1% of microbes in nature have been discovered to date. Basecamp Research, a biotechnology company based in the UK, is changing this. In collaboration with PollinoUGGp, Basecamp Research set out to study the microbial communities that exist in this ecosystem to discover sustainable biology-based solutions in the biotechnology sector and to promote understanding and conservation of Earth's wild places. In April 2022, The Basecamp Research Team conducted a microbial biodiversity baseline study in the Pollino area. To conduct this study, the field researchers from Basecamp Research collected small environmental samples from a vast array of different habitats across the Geopark. The sample sites were determined by the presence of biodiversity hotspots and high habitat heterogeneity. Basecamp Research collected 50 (250ml) environmental samples from each habitat which is present to give a comprehensive read of the microbial biodiversity within each area. The Basecamp Research team conducted all sampling non-invasively and on foot, to ensure that they did not interfere with the natural ecosystem. Post sample collection, the field researchers extracted the DNA from biological material in each sample using their cutting-edge fully portable DNA-analysis lab, and then used computational analysis to identify previously unseen microbes! This method unlocks vast amounts of novel, fully annotated, and ethically sourced protein sequences from nature. The results of the research showed a high species richness present in the park, a large number of unique taxa identified, and also a high percentage of unknown genera. This data unlocks a greater understanding over the microbial communities present within PollinoUGGp, emphasizing the significance of quantifying microbial diversity for gaining insights into broader biodiversity patterns. Win-win collaboration: From biodiversity to biotechnology. The advanced genome analysis tools provided by Basecamp Research help us to further understand the relationship between geology and the metabolic diversity within our park for conservation and information purposes. While the proteins that Basecamp Research discovers can be used in all sectors of the bioeconomy, from agriculture and nutrition to materials and pharmaceuticals. Their mission is to use commercial biodiscovery to seamlessly connect biodiversity with the bioeconomy, fostering a sustainable future for both natural ecosystems and human industries. This project highlights the importance of exploration and science to understand the true power and complexity of nature so that we may better protect it in the future.

UNESCO GLOBAL GEOPARKS AS WITNESSES TO THE THREAT OF CLIMATE CHANGE

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In recent decades scientists of the IPCC and other institutions have warned of imminent, drastic changes to the Earth's climate system, largely brought on by the steady increase in atmospheric carbon dioxide from the burning of carbon-based fuels. We are now living in these times. Geoparks around the world are witness to extreme weather events including unprecedented heat waves currently being experienced in Morocco, Spain and Arab States, unprecedented wildfires across Canada, record cyclones in Asia, the Caribbean and North Atlantic, and the end members of severe drought and punishing rain events across Europe and Africa. UNESCO Global Geoparks are positioned to bear witness to these changes, and to bring them to worldwide attention through the anecdotal stories of their people. More powerful than the predictive charts and models of climate change science, personal stories of the impact of climate change have the power of bringing the reality of climate change to decision makers and to the global community. Such personal experiences of global change gathered over the past decade from international students at Saint Mary's University in Canada illustrate the power of grassroots voices – the testimony to the impacts of climate change - that Global Geoparks can provide.

TEZOANTLA TUFF ("CANTERA DE TEZOANTLA"), COMARCA MINERA UNESCO GLOBAL GEOPARK: THE FIRST MEXICAN IUGS HERITAGE STONE

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The Tezoantla Tuff ("Cantera de Tezoantla" in Spanish) was designated as a 'Heritage Stone' (HS) by the International Union of Geological Sciences (IUGS) on October 22, 2022, under revised criteria that were approved the same year, being the first in Mexico and the second worldwide to be awarded a volcanic tuff. It is a volcanic ash tuff of Miocene age, with low-temperature argillic hydrothermal alteration (zeolitization), that has been quarried for at least 400 years in the municipality of Mineral del Monte of the Comarca Minera UNESCO Global Geopark (UGGp). Due to its aesthetic value (in particular, the white variety) and suitable physical properties, this stone has been used as building and sculpture material in notable monuments of Baroque and Neoclassical styles of the state of Hidalgo and the historic center of Mexico City, most of which are cataloged in different lists of cultural heritage. In addition, it has been widely used in vernacular architecture and in industrial constructions that are part of the outstanding mining heritage of the geopark, with Cornish engine houses (19th century) standing out. The HS designation of Tezoantla Tuff makes visible the link between geoheritage and the cultural heritage —including mining heritage— of Hidalgo and reinforces the global value of the geoheritage of the Comarca Minera UGGp.

THE GEODAYS CARRIED OUT IN THE EL HIERRO GEOPARK: A RESOURCE FOR THE DISSEMINATION OF ITS GEOLOGICAL HERITAGE.

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A Geoloday is a holiday for the dissemination of Geology, in which geological field trips guided by geologists are carried out, free and open to all, in which it is intended to bring this Science closer to citizens.

Since 2005, on the first or second weekend of May, each province in Spain held a Geoloday, which take place in environments of great geological interest and offer simple but rigorous information.

They allow us to see those places with “geological eyes” and understand how the Earth on which we live works and on whose natural resources we depend. Those who participate also understand the value of our geological heritage and the need to protect it.

On the Island of El Hierro, 9 Geolodays have already been held every year, from 2013 to the present (with the exception of 2020 due to the COVID-19 epidemic). The itineraries chosen in these Geolodays have been very varied. In general, they have been carried out on foot, although some were carried out with the help of a bus and, exceptionally, in 2017 they were carried out by boat.

In these geolodays it has been tried that the population of El Hierro knows the most significant elements of its geological heritage. In this sense, they have been dedicated to the knowledge of its coastal forms (year 2019, "Walking through the stone arches of El Hierro"; year 2021, "When the lava flows reach the sea"; year 2023, "A coastline of magical shapes"); to the geological structures related to the megalandslides that affected the island (year 2014, "A look into the bowels of Guinea and the megalanslide in El Golfo"; year 2015, "El Hierro, vertigo viewpoints in the Geopark"; year 2018, "The aborted landslide of El Hierro"); of the volcanic edifices, lava fields and volcanic tubes generated in the volcanic eruptions that occurred in El Hierro (year 2013, "Discovering Tanganasoga. El Hierro."; year 2014, "A look into the bowels of Guinea and the megalanslide de El Golfo"; year 2016, "Isla baja de Lomo Negro-El Verodal"; 2017, "A look at the volcanic cones: the cliffs of El Hierro"; year 2022, "Walking among lavas").

For each of these Geolodays, a leaflets was created that served as support for the explanations that were made at each of the points of the itinerary. This diptych contained a satellite photo with the location of the different stops, as well as a photograph and its description of the chosen points. Graphics were also included to help interpret the itineraries.

The itineraries themselves and all this interpretative information will serve to condition and illustrate the itineraries of the El HierroGeopark itself.

ESTRELA UGGP: A KEY PARTNER IN THE CO-MANAGEMENT OF THE SERRA DA ESTRELA NATURAL PARK

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The UNESCO Global Geoparks(UGGp) have a key role in the preservation and promotion of its territories, using its geological e geomorphological values to foster the natural, cultural and intangible heritage that is encompassed in these UNESCO designated areas. However, this role is strengthened when there is a good relationship with the other entities that manage the territory, using networking as a means to a common goal.

In many UGGp, their territories also coincide, in its entirety or partially, with protected areas, that have long promoted the regions natural and cultural values. However, these protected areas have always had a greater focus on biodiversity, and it has been the UGGp that have brought Geoheritage to the forefront of the public eye. As such, in many cases, this networking between the UGGp and the protected areas has helped strengthen the preservation and promotion of these territories.

In Portugal, in the last few years, the government has implemented a co-management model that goes in line with this networking towards the preservation and valorization of its protected areas. This model aims at enhancing the values of each protected areathrough sustainable and concerted procedures, improving the preservation ofthe natural values and creating a closer relationship with citizens and relevant stakeholders for the promotion of the sustainable development of each protected area.The aim of this model is to create a greater proximity in the management of the protected areas, with inputs and expertise from the different stakeholders, putting into practice a participative, collaborative and articulated management, specifically in the fields of promotion, awareness-raising and communication of the territorial natural values present.

Following with the above, the Estrela UGGp has, since its beginning, been a partner of the Serra da Estrela Natural Park and, with the creation of the co-management model, it was unanimously appointed the co-manager of the natural park, showing the relevance and recognition of the management structure of the Estrela UGGp in the territory. As such, in partnership with the management of the Serra da Estrela Natural Park and other key stakeholders, this protected area now has a co-management plan that will see all the strategies from all of these entities now combined in order to better use their efforts in the valorisation and promotion of the territory, both in what regards education and tourism, but also in the awareness of local populations and visitors, as a well as in the implementation of new communication strategies that will strengthen the areas' attractiveness.

In conclusion, it is clear that the UGGp have an important role in helping the protected areas in their territories and that the networking among several stakeholders can create better strategies that help promote and value the relevant heritage that these encompass. In the case of the Estrela UGGp, the new co-management model allowed for the creation of a new network of partners that, through the implementation of the co-management plan and its actions, will reinforce Estrela as "the Mountain" in Portugal.

SOME WAYS TO AVOID OVER-TOURISM FROM A GEOPARK MANAGEMENT PERSPECTIVE

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While geoparks have a common goal of attracting visitors for education and the promotion of sustainable development and the local economy, there have been cases in which heavy visitation has caused various problems, such as over-crowding, littering, and disturbance to the natural environment and local communities. Hong Kong Geopark, as well as the rest of the countryside in Hong Kong, has experienced similar problems before and during the pandemic.

To tackle the problems of over-tourism, Hong Kong Geopark has planned broad measures such as diverting visitors away from popular geosites, to smaller scale on-site measures and measures to tackle specific problems.

Lai Chi Wo is a popular rural village in Hong Kong Geopark, resulting in the concentration of visitors. To divert visitors from the village, other villages around Lai Chi Wo will be promoted as new attractions by establishing a Hing Chun Alliance Heritage Trail connecting Lai Chi Wo and six other neighbouring villages. After visiting Lai Chi Wo, visitors will be encouraged to leave Lai Chi Wo and visit the other villages. This will reduce the number of visitors in Lai Chi Wo at any given time, while promoting the other less-known villages. In the Sai Kung area, where visitors tend to concentrate at the East Dam geosite to appreciate the IUGS Geological Heritage of the rhyolitic columnar rock formation, two less popular geosites in the area are being developed and promoted through a major event, the Sai Kung Hoi Arts Festival. The general promotional strategy has also been carefully planned to avoid over-promoting the East Dam geosite.

As an indirect control measure, transportation is being explored to control the flow of visitors. For example, ferry operators will be encouraged to use smaller boats but run more trips instead of using a big boat for few trips. This will help spread the visitors out, as they will arrive at different times of the day.

Once the visitors arrive on-site, proper planning of the tour routes will direct visitors to appropriate attractions. Under this principle, the Kat O Heritage Trail was established in 2021. It directs visitors to a less-known scenic hill top and thus away from the fishermen's village, where too many visitors create a disturbance to the villagers. In the case of the BiuTsimKok hiking trail, one footpath was constructed leading to a viewing platform, while another footpath was constructed for the return trip, separating the two visitor flows along the narrow footpath.

Over-tourism sometimes creates specific problems due to visitor misbehavior, such as littering and disturbing the tranquil environment through the use of loud speakers. To tackle these specific problems, Hong Kong Geopark promotes related messages, such as "take your litter home" and "keep the noise down". The messages are disseminated to tour guides, and put up on the ferries and prominent places in the geosites.

A thorough understanding of what makes some geosites popular is essential for solving the problems and planning appropriate measures. Factors include attractiveness, accessibility, difficulties and promotion strategies. Solutions are required for the unique situation of each geosite, with considerations such as feasibility and resource implications. On the other hand, understanding factors that make each geosite popular also helps planning for measures to establish or promote a geosite, in particular for sites which are less popular.

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THE JBEL ZERHOUN GEOPARK, A TOOL FOR GOVERNANCE OF TERRITORIAL RESOURCES, NATURE CONSERVATION AND PROMOTION OF LOCAL PRODUCTS

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Why the Jbel Zerhoun Geopark?

First and foremost, for the conservation of nature and sustainable territorial development. These two essential components are part and parcel of a multi-stakeholder commitment to the implementation of the SDGs. Secondly, the Zerhoun region boasts:

A very rich and varied cultural heritage (the archaeological site of Volubilis, architectural ensembles, urban and rural historical jewels, places of spirituality and ethnological and symbolic paraships...).

A remarkable natural heritage (exceptional natural landscapes, located in a picturesque site with multiple natural resources, an atypical geological history of the Zerhoun massif, a wealth of flora and fauna including several endemic areas, potential for ecotourism and promotion of local products...).

The cultural landscape reflects the space in which the various activities and specific techniques of viable land use take place, while taking into consideration the characteristics and limits of the natural environment in which they are established, as well as the specific spiritual relationships woven through time with the natural setting. Our site is an example that is capable not only of responding to historical and archaeological issues, but of making heritage a catalyst for development in a landscape context.

Data from historical sources, together with archaeological and numismatic data, enable us to retrace the eventful history of the Zerhoun massif. The Zerhoun cultural landscape (including its natural and geological dimensions) has particular needs for strategies and actions to maintain the traditional and cultural associations that give these places outstanding universal value. The identification of these associative values by the local community takes place during the inscription process. In order to safeguard the various values, it is essential to initiate the procedure to label this World Heritage site a Geopark.

Throughout its 10 years of existence, the Ifker Association has always worked closely with public institutions to contribute to the conservation of the natural and cultural resources of the Zerhoun massif. Decentralized cooperation projects with the Meknès Prefectural Council and the Landes de Gascogne Regional Nature Park and the Ifker Association, as well as projects with IUCN, have strengthened this multi-stakeholder partnership in favour of sustainable development and the creation of the JbelZerhounGeopark. The JbelZerhounGeopark is the natural culmination of an ongoing collective effort with local and regional players (Eaux et Forêts, Fès-Meknès Regional Council, Meknès Prefectural Council, Meknès Prefecture, elected representatives of the Massif de Zerhoun, representatives of ministerial departments, NGOs, etc.) to build a sustainable territorial development project aimed at protecting and enhancing natural, cultural and human heritage. Trust has been built up, and commitments have been made.

ENHANCE INTEGRATED MANAGEMENT OF UNESCO MULTI-DESIGNATION WITH OTHER UNESCO SITES

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Huangshan has 3 UNESCO designations, World Heritage, Global Geopark and Biosphere Reserve. Recent years, we have taken several measures to enhance the integrated management among these three. One of the action we made is to build a forum for UNESCO multi-designated sites. In order to deepen the cooperation and exchange between UNESCO designation sites, We've contacted several UNESCO Global Geoparks such as Cilento (Italy), Azores (Portugal), and Jeju Island (Korea) in 2020 to jointly initiate the Forum for UNESCO Multi-designations sites.

The purpose of the forum is to exchange practical management experience and problems encountered in the management process of each site, jointly explore and share integrated strategy. After several meetings, the forum members have learned different situations, actions and methods they have on multi-designations management. Now, we are working on a book to show the cases of each forum members, hoping it would give other UNESCO sites some inspiration. And, the forum keeps on growing, and we hope more UNESCO sites would join us.

**ENGAGING THE DISABLED PEOPLE IN SUSTAINABLE TOURISM IN HONG KONG UNESCO
GLOBAL GEOPARK – EXPERIENCE SHARING BY ASSOCIATION FOR GEOCONSERVATION, HONG
KONG**

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Geo-diversity refers to “the natural range (diversity) of geological (rocks, minerals, fossils), geomorphological (landforms, topography, physical processes), soil and hydrological features. It includes their assemblages, structures, systems and contributions to landscapes” (Gray, 2013). Geo-diversity is the basis of all ecosystem services and an intrinsic part of humanity's relationship with nature (UNESCO, n.d.). However, people with disabilities generally face difficulties in visiting the geo-sites which may be remote, the paths may be difficult and few facilities for them. According to the key facts of WHO (7 Mar, 2023), about 16% of global population (1.3 billion people) lives with different disabilities. It is our social responsibility to ensure equal opportunities for all to enjoy sustainable tourism, which is vital for human rights and making cities inclusive and sustainable. In 2020, there were some 534,200 persons with disabilities, representing 7.1% of the total population of Hong Kong. The five most common types of disabilities include restriction in body movement, seeing difficulty, hearing difficulty, mental illness/ mood disorder, and communication difficulty. The lack of accommodating facilities and trained people generally hampers the disabled people to learn and appreciate our rich geo-diversity and geo-heritage in Hong Kong UNESCO Global Geopark (HKUGGp). They need the help from other individuals to effectively navigate and appreciate the geo-sites. Some researchers suggested that the physical, informational, and attitudinal barriers are the major barriers facing the disabled people in tourism (Garrod and Fennell, 2023). Therefore, considerations are vital in the sustainable tour and activity design, geo/eco/cultural interpretation, people-based training of volunteers and tour guides in engaging the disabled people in sustainable tourism and meeting their needs for nature enjoyment and enhancing their quality of life. This presentation aims to share the experiences of Association for Geo-conservation, Hong Kong (AGHK) to engage the disabled people in sustainable tourism in HKUGGp and shed insights for future improvements in providing accessible sustainable tourism for the disabled people.

PHON SUNG ECO-COMMUNITY: A FOOD SOURCE FOR KHORAT GEOPARK AND CONTRIBUTING TO BOTTOM-UP DEVELOPMENT

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Phon Sung Eco-community serves as the Sufficiency Economy Philosophy learning center for Khorat Geopark. The founders of this center have successfully applied the principles of King Rama IX's philosophy to enhance sustainable income for local communities. It is situated on the outskirts, north of the Nakhon Ratchasima city, thriving as an ecological agricultural area, coexisting harmoniously with one of Thailand's prominent economic towns.

The communities are on a flat low-lying terrain between Lam Chiang Kai and Lam Takhong rivers. The 130 – 217 ka-fossil-bearing sediments about 8 meters thick in the nearby Ban Khok Sung is on an unknown bedrock. The general soil condition in Ban Phon Sung Community is the result of flood sediment accumulation from the river, resulting in fertile soil enriched with essential minerals for plant growth. This fertile soil enables the community to cultivate a diverse range of economic crops. Moreover, Ban Phon Sung Community holds significant potential as a production source within the Khorat Geopark area, characterized by its unique identity and distinct features that reflect the local way of life. The community engages in agricultural product processing, particularly food processing, which is sold in community shops as well as in the Khorat Geopark network. Additionally, the community serves as a learning center and agricultural tourist attraction, catering to both youngsters and the general publics. This holistic approach generates income for the community, aligning with the Geopark concept of conservation, education, and sustainable development.

This bottom-up development approach is in line with the United Nations Sustainable Development Goals (SDGs), particularly SDG 1 on ending poverty by generating income for the community, SDG 2.4 on promoting sustainable agriculture to enhance food security and nutrition, SDG 3.9 on reducing illness caused by hazardous chemicals and promoting the use of natural fertilizers, SDG 4 on supporting lifelong learning opportunities, SDG 5 on ensuring equal participation of local communities of all genders and ages, SDG 6.b on managing water and sanitation sustainably for all, SDG 8 on fostering sustainable and inclusive economic growth and decent employment, and SDG 12a on supporting the use of scientific and technological tools for sustainable agricultural production. Despite its proximity to the city, the Ban Phon Sung Agricultural Ecological Community Area offers tranquility and abundant nature. It remains an area continuously developed for the sake of sustainability for future generations.

TECHNOLOGY AND INNOVATION TRANSFER BETWEEN CHILE AND URUGUAY FOR INTEGRATED MANAGEMENT IN UNESCO SITES DESIGNATIONS.

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Networking is promoted by UNESCO among all its programs, then, is one of the fundamental principles of UNESCO Global Geoparks. Strengthening regional networks is encouraged, as well as the collaboration between different UNESCO designations, in order to exchange support and mutual assistance, for example in capacity building. Networking contributes to the success of the programs and plays a valuable role by facilitating the exchange of experiences, good practices, quality management, the formation of joint initiatives and projects that promote greater participation of local communities, generating inclusive and sustainable development. During year 2021, the Uruguayan Congress of Mayors, in partnership with Kutralkura UGGp, from Chile and Grutas de Palacio UNESCO Global Geopark from Uruguay jointly presented a project to the UNESCO Funds Program, through the National Commission for Uruguay to UNESCO. The project consists in transferring a methodology developed by Kutralkura UGGp, for a multistakeholders participatory survey, through a mobile application (apps), that allows the collection of heritage information in an integrated way (natural abiotic, biotic, tangible and intangible cultural). Based on the values of the UNESCO Global Geoparks Program, the proposal was extended to all sites with UNESCO designations in Uruguay: World Heritage Sites, Biosphere Reserves, UNESCO Global Geopark and Uruguayan Geoparks projects, which are developed in 10 of the 19 Departments of Uruguay. The collection and systematization of data from sites with heritage value will be carried out by the key actors in the territories, (teachers, local guides, rangers, etc.), since it is assumed as a process of transfer and social innovating in training from the implicating in the recognition and heritage value. The application works offline (without internet connection), in order to store the information captured in the field, which includes many open text fields, single/multiple sectors and attachment of photographs when a connection is available. The results obtained will allow the implementation of tourism promoting platforms through webpages or applications, generate greater visibility of sites with UNESCO designation, promote the involvement of locals in the generation of Geotourism, Geoeducation, and Geoconservation, strengthen networks between UNESCO sites and the GeoLAC network.

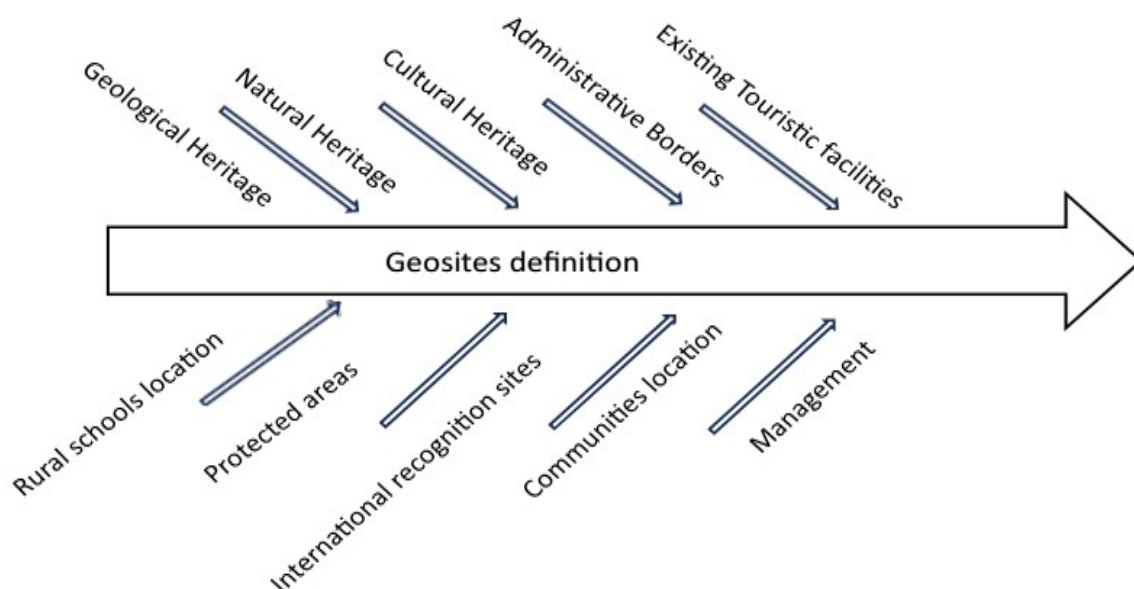
METHODOLOGICAL CRITERIA APPLIED TO GEOSITES DEFINITION IN TWO GEOPARK'S Projects in Uruguay, South America Manantiales Serranos Project Geopark – Lavalleja Uruguay, Cerro Largo – Lavalleja – Uruguay

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Abstract

Based in the concept that “Geosites”, are sites of the Geopark, and that each site should highlight the links between the geological, natural or cultural heritage, the selection of Geosites is a complex process that involves interdisciplinary academic research as well as the implication of local communities and authorities, exercising the governance since the early beginning of the project geopark. During the process executed in two territories in Uruguay, “Manantiales Serranos Project Geopark” and “Cerro Largo Project Geopark”, we followed a methodology that implicated a multilateral input to research and select potential Geosites, based in the concepts showed in the following fishbone diagram.



First input are geological, natural and cultural heritage inventories, highlighting the ones of international value and local significance that will bring the first preliminary area to be considered in base of administrative borders. Since Geosites are the tools for local sustainable development, the following concept, will be the community's location and/or rural schools, the ones who will be empowered to develop Geotourism, Geoconservation and Geoeducation on these sites. Then the process will continue checking every other requirement and benefits to choose the preliminary geosite to be developed as a definite Geopark's Geosite, accomplishing with the interpretation, facilities and infrastructure, local guides preparation, visibility, etc. according to the UNESCO Global Geopark standards.

**UNESCO GLOBAL GEOPARKS, INTEGRATED TERRITORIAL PLANNING AND MANAGEMENT
TOOLS FOR INCLUSIVE AND SUSTAINABLE LOCAL DEVELOPMENT**

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UNESCO Global Geoparks, along with World Heritage Sites and Biosphere Reserves, constitute tools for sustainable development and contribute to the achievement of the 2030 Agenda (SDGs) through the combination of global and local perspectives.

From this conceptual framework, we assume that Geoparks are instruments for land planning and local management through the design of integrated policies, plans and projects linked to the UNESCO Global Geopark's criteria, to the local geological, natural and cultural heritage, represented by the 10 priority themes, to perform a governance model with territorial relevance. As it is stated by the IGGP and GGN, the construction of a strategic territorial plan should be based on heritage valorization, making alliances and promoting local, national and international networks, as well as the recognition of ancestral and local knowledge, while generating a common vision based on the ethical obligation to contribute to the well-being of the families living in these unique rural territories. The entity in charge of the Geopark's management, therefore, assumes the commitment and permanent deployment in strengthening and articulating agendas between local stakeholders and public authorities, academic and private institutions. But above all, to design a process that allows to influence the design of the Geopark's strategic plan integrated to the planning system at different governmental levels, and ensuring it through the time, for a sustainable and inclusive local-territorial development.

SCHOOLS OF ROCKS (AND MANY MORE). GEOCONVIVENCIA: LET'S CELEBRATE SDGS IN VILLUERCAS-IBORES-JARA UNESCO GLOBAL GEOPARK, SPAIN

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- 3.

Geoconvivencia is the day we celebrate Geocentros (Geocentres), our educative project, in Villuercas-Ibores-Jara UNESCO Global Geopark, Spain. All the Geocentres (schools, high schools and special education centres) meet annually, each time in one of our villages during EGN Week, to share good educational practices.

Due to the SDGs are at the heart of the UNESCO Global Geoparks and the Geocentros project (and in the latest educational law in Spain), the geocentres develop their activities focused not only on patrimonial aspects of the geopark (geological, natural and/or cultural), but based on one or more SDGs.

Geoconvivencia arose as a pilot experience in one of our geocentres during the Geopark project. Over the years (and except for the 2020-2022 period due to Covid-19), it has grown to become a great educational and festive day for our territory. It has even had the participation of students and teachers from other nearby geoparks.



The last one was held in Peraleda de San Román (304 inhabitants in 2022), with a participation of 800 participants between students, teachers and collaborators (volunteers from institutions, from the locality, etc.). In this case, also with students of a high school with a formative cycle in physical-sports activities, which was very useful for them to gain experience and complete their curriculum, being a great example of union of the territory and educational activity at all levels. The programme contained fun activities (as a track race and tests with which to interact with the local population), geological workshops and an exhibition with the geodiversity of the geopark.

But the culminating moment is a seminar in which students show the results of their teamwork activities linking the geopark with the SDGs. As on other occasions, the seminar took place in a prominent place in the town, in the town's main square. This is so because it is open to the participation of all people who want to attend (families of students, locals and people from neighboring towns, tourists, etc.), becoming a great tool for disseminating the heritage of the geopark and the SDGs. Come to the *Geoconvivencia* to know our planet and how to make it a better place!!!

THE EOCENE-OLIGOCENE BOUNDARY, THE KEY TO INTERPRETING AND RAISING AWARENESS OF THE EFFECTS OF CLIMATE CHANGE IN THE CATALUNYA CENTRAL UNESCO GLOBAL GEOPARK

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At Costa de la Vilageosite, in the centre of the Geopark, is the footprint of a temperature drop, which meant a significant change in the ecosystem. 33.9 million years ago, the Earth underwent a major climate change. A global decrease of 8 to 12°C lasted one million years and was conditioned by reduced CO² levels in the atmosphere. It meant a profound transformation of the landscape and a great extinction of animals and plants and led to a replacement of the communities of fauna and flora. This event is known as the *Grande Coupure*.

During the Oligocene, a polar ice cap was generated in the Antarctic, transforming the water mass distribution and, therefore, the land that emerged throughout the planet. In our latitudes, at the landscape and ecosystem level, the tropical and subtropical forest that predominated during the Eocene would be replaced by a temperate deciduous forest, as well as large meadows due to the appearance of the first grasses. This temperature change led to important changes in European terrestrial mammal fauna. Many of these mammals, among others, became extinct. The opening of large land passages due to the closure of some straits led to the migration of many species of animals from Asia, leading to a change in habitats.

The Geopark uses this noteworthy fact in the geological past for some of the actions to raise awareness about climate change and, from there, as a basis for mitigating its effects. Particular emphasis has been placed on developing didactic material since scholars are considered one of the main objectives. Specific material has been created about this outcrop, and among the educational activities that are part of the Geopark educational suitcase, one specifically focuses on this event. These actions are intended for students to grasp the idea that climate change has important implications in their lives and their present and future.

This particular site is also a place of attention on some guided tours that we take in the Geopark, and the fact that it is visible from many points of the territory means that we can constantly refer to it. This geosite is an ideal place to raise awareness of the importance of climate changes in the past and their effects, and thus influence society on raising awareness of this fact.

ECOSYSTEM SERVICES IN TERRITORIES OF UNESCO WORLD GEOPARKS: CASE STUDIES IN ARARIPE (BRAZIL) AND AROUCA (PORTUGAL) GEOPARKS

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Geopark Araripe, the first in Brazil to be recognized by UNESCO in 2006, has an approximate area of 4000 km² and 11 classified geosites. The Arouca Geopark, located in Portugal, was classified in 2009 with an area of 328 km² and 41 classified geosites. The two territories offer several Ecosystem Services (ES) that directly and indirectly benefit human well-being. Identifying and classifying these services is important to ensure and enhance their offer, resulting in economic development for the communities involved, greater conservation of natural resources (geodiversity and biodiversity), in addition to reinforcing the importance of geoparks in the sustainable development of their territory.

The identification and classification of ES (Ecosystem Services) in the geosites and main attractions of the referred geoparks took place in field research between the years of 2020 and 2023. A desktop study and the CICES classification (*Common International Classification of Ecosystem Services*), which groups ES into the provision, regulation and cultural categories, were also used during research. The CES (cultural ecosystem services) were the most present in both geoparks, with emphasis on Leisure, Educational, Spiritual and Cultural Identity CES. However, in the Araripe Geopark the ES provision (PES) and regulation (RES) gain importance, since the territory covers a large part of the National Forest (FLONA) of Araripe and a water wealth represented by more than 200 springs. The *Pedras Parideiras* and *Trilobites* Museum Geosites, places of international importance present in the Arouca Geopark, as well as the Museum of Paleontology located in the territory of the Araripe Geopark, are the most relevant places in the offer of Educational CESs due to the knowledge they provide, receiving a significant number of school visits per year. Other relevant CES are represented in the existing organic museums in the territory of the Araripe Geopark, such as the “Mão na Massa” Organic Museum, where the clay taken from the soil (provision ES) is then transformed into cultural ecosystem service, through the handling and production of handcrafted pieces, which promotes the economic development of the artisan and the reinforcement of the cultural identity of the territory. In the Arouca Geopark territory, the production of Arouca meat (provision ES) also translates into a cultural ecosystem service, considering that the way of raising the bovine species is part of local traditions, resulting in the cultural identity of the territory. In terms of CES focused on spirituality or the sacred, the Geopark Araripe has the Geosite Colina do Horto, in which spiritual value is linked to the story of Padre Cícero and the scientific value to the fact that it presents the oldest rocks of the territory. Due to its cultural significance, this is the most visited place within the territory. In the Arouca Geopark, the sacred is also expressed through the story of Santa Mafalda, in the Monastery of Arouca.

Thus, the territories of the geoparks studied are very rich and diverse in terms of ES offer, and should be the subject of several other scientific studies, which allow transforming all this richness into opportunities that guarantee the conservation of natural and cultural resources, and at the same time as the development of local communities, an unquestionable premise of the UNESCO World Geoparks. The results presented are preliminary and form part of a doctoral research in Geography at the University of Coimbra, which is expected to reinforce the importance of geoparks in maintaining the natural diversity of territories, as well as in promoting human well-being.

Keywords: Geoparks; Ecosystem Services; Well-being; Economic development

GEOARCHAEOLOGY INTERPRETIVE TRAIL ALONG THE «CERRO DE LAS NAVAJAS» IUGS ASPIRING GEOLOGICAL HERITAGE SITE, COMARCA MINERA UNESCO GLOBAL GEOPARK, MEXICO

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«Cerro de Las Navajas» (CLN) is named after the Aztec toponym “Itztepec”, which means “the obsidian hill”. CLN is situated within the Comarca Minera UNESCO Global Geopark in the eastern sector of the Trans-Mexican Volcanic Belt, Mexico, and stands as one of the 33 captivating geosites within the region. This site bears international geological significance due to its association with a Quaternary peralkaline stratovolcano that led to the formation of a unique green-golden obsidian. As a consequence of the northward-lateral collapse of the volcano, the obsidian flows were fractured, displaced, and buried. This led to the formation of layers of mixed blocks of pumice, rhyolite, and obsidian that extend for kilometers and reach thicknesses of up to 100 m. This volcanic activity coexisted with monogenetic volcanism producing outstanding columnar jointing to the north. The geological features of CLN have not only shaped the landscape but also left a considerable mark on Mesoamerica and Aridoamerica’s cultural history. The archaeological records discovered at CLN offer compelling evidence of Mesoamerican cultures that practiced complex and organized underground mining and traded the obsidian from around 250 BC until earlier colonial times. Evidence of trade can be found in present-day Guatemala and Arizona, USA, to name a few locations. Other magical-religious aspects surrounding this obsidian can be traced to Aztec poetry, deities, and practices. It is still an open question to what extent this obsidian contributed to the intangible cultural practices of Mesoamerica. Since 2022, this site has been aspiring to be an IUGS Geological Heritage Site.

Due to its international geoarchaeological significance, CLN offers a unique opportunity for the development of an interpretive trail, serving as a new geotouristic attraction and guide for the community. The project was initiated in 2021 during conversations with the archaeology team and gained force once presented to the community in 2022. To achieve this, a series of community talks and meetings with representatives have been conducted to socialize the idea and establish partnerships. The fieldwork has been organized into stages. The first stage involves the reconnaissance and mapping of the ascending portion of the trail, while the second stage focuses on the descending portion. As a result, an approximately 11 km trail with a 300 m vertical height difference has been created, providing an opportunity to interpret the geoarchaeological sequence of exploitation and observe typical biotic elements. The trail will feature informative panels when appropriate, trail maps, leaflets, and captivating podcasts, showcasing the site’s geological and historical importance. The trail is named “Itztli”, from the Nahuatl that means “obsidian instrument”.

“ATLANTIC GEOPARK” PROJECT (PORTUGAL)

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The “Atlantic Geopark” Project represents the initial steps towards establishing an UNESCO Global Geopark in the central littoral and rural regions of Portugal, encompassing the municipalities of Cantanhede, Figueira da Foz, Mealhada, Mira, Montemor-o-Velho, and Penacova.

This area boasts a unique and distinctive geodiversity, showcasing geological heritage that tells the story of the Rheic Ocean's opening and closing, the breakup of the supercontinent Pangea, and the formation of the North Atlantic Ocean. Alongside its internationally significant geological heritage, the region also possesses geoheritage resources tied to local geological features, which will serve as essential elements in a future application to join the Global Geopark Network.

Spanning approximately 1452 km², the “Atlantic Geopark” Project is bounded by the municipality of Mira to the north, Penacova to the east, Figueira da Foz to the south, and the North Atlantic Ocean to the west, featuring 60 km of coastline. In terms of population, the territory is home to 162,686 inhabitants (Censos, 2021), resulting in a population density of 112 inhabitants per square kilometer.

The geological legacy of the “Atlantic Geopark” Project encompasses over 600 million years of the Western Iberia's geological evolution, ranging from Neoproterozoic times at its eastern border to the Holocene at the Atlantic margin. This rich history includes several noteworthy geological formations:

The Ordovician, Silurian, and Carboniferous strata found in the Penacova and Mealhada (Buçaco region) municipalities, documenting the Rheic Ocean's opening and Pangea's assembly.

The Upper Triassic siliciclastic rocks in the Mealhada municipality, representing the breakup of Pangea.

The Jurassic evolution of the North Atlantic Ocean, well displayed in Cantanhede and Figueira da Foz, with notable formations including the Bajocian GSSP and the Bathonian ASSP.

The Cretaceous marine transgression (Cenomanian-Turonian) preserved in Montemor-o-Velho municipality.

The Quaternary geodynamics of the Atlantic margin in Mira municipality.

These geological features have been integral to various communities since ancient times, and their significance is showcased through monuments, museums, interpretative centers, and recreational trails for walking, hiking, and cycling. Moreover, this geological legacy is reflected in traditional gastronomy and practices, contributing to the distinct identity of the “Atlantic Geopark” Project, which encapsulates 600 million years of geological history.

Keywords: Atlantic Geopark Project, West Iberian Geo-history, Geoheritage Resources.

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VALORISATION OF GEOLOGICAL HERITAGE SITES IN THE LAND OF EXTINCT VOLCANOES GEOPARK BASED ON THE EXAMPLE OF THE CLOSED BASALT MINE "WILCZA GÓRA"

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In 2018, the Kaczawskie Association, the coordinating entity of the Land of Extinct Volcanoes Geopark, commissioned a Geological Inventory necessary for application to the UNESCO Global Geoparks Council. The inventory included a geological and geomorphological description of the area and a description of 130 geopoints. The inventory also included a valorisation of all the sites. The scientific, educational, ancillary, aesthetic value, accessibility and state of preservation were assessed.

One of those places is Wilcza Góra. The hill owes its present-day appearance to natural processes, while its asymmetrical shape is the result of mining activity. An older quarry was located on the western side of the culmination and was exploited at the turn of the 19th and 20th centuries. In 1959, an open-air nature reserve "Wilcza Góra" with an area of 1.69 ha was established in the former quarry. Until 2019 there was basalt active mining in the eastern part of the hill. The deep excavation was inaccessible to visitors, but perfectly showed a cross-section of the former volcanic chimney and the three phases of volcanic activity. In 2022, recultivation was completed and the mine was opened to the public. Wilcza Góra demonstrates great educational value. It represents the so-called Lower Silesian Basalt Formation which consists over 300 individual occurrences of basalt and related rocks formed in the time interval from the Eocene to the Middle Miocene. The lavas sometimes contain pieces of Permian, Triassic and Cretaceous sedimentary rocks of the surroundings and older lavas. In addition, numerous xenoliths of the Earth's mantle, enclaves of olivine a few centimetres thick and volcanic breccias occur within the volcanites. Of particular note are the undisturbed sections of basalt columns standing upright, the concentric arrangement of fractures known as the "basalt rose" and the basalt veins cutting discordantly through the sandstone. The Kaczawskie Association had been making efforts for years to have the site sold to the Municipality of Zlotoryja following the end of mining and recultivation, which was successful. The recultivation of the quarry was carried out in the direction of agriculture, forestry, green areas, nature with recreational and educational functions and industry. The resulting infrastructure in the recreational and educational area has opened up part of the closed quarry. As a result, the accessibility of the site has increased significantly, with the possibility of fully using its educational potential. The aesthetic value and general condition of the site has also increased, including the reserve section, which was largely covered with plants. The activities have meant that the site is today the highest ranked geopoint in the Land of Extinct Volcanoes Geopark. The example of Wilcza Góra proves that it is necessary to update the valorisation of geopoints in geoparks.

Keywords: geopoint valorisation, geoparks, geological heritage, Cenozoic volcanism

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INVASIVE ALIEN SPECIES AS A NATURAL THREAT TO BIODIVERSITY IN THE AND OF EXTINCT VOLCANOES

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A survey of local residents on natural hazards shows that they are most concerned about drought and flash floods - as consequences of climate change. From late spring to early autumn, long periods of drought are interrupted by violent storms with intense precipitation, occurring very locally and causing flash floods. Such an outcome was expected given that some people are involved in agriculture and take water from their own well.

The question on invasive alien species showed that, on the one hand, the topic is not foreign to some, but on the other hand, the concept of 'invasive alien species' is not fully understood. The relatively recent regulations and procedures described mean that people do not yet know how to deal with them. The benefits of certain species for e.g. beekeepers overshadow the real threat to the environment.

In the area of the Land of Extinct Volcanoes Geopark, of the species posing a threat to the EU, but widely distributed, the most common are: purple jewelweed (*Impatiens glandulifera*), Sosnowski's hogweed (*Heracleum sosnowskyi*) and raccoon (*Procyon lotor*).

From the list of species threatening Poland and widely distributed are: the wild cucumber (*Echinocystis lobata*) and various species of knotweed (*Reynoutria sp.*).

The very common canadian goldenrod (*Solidago canadensis*) is also an invasive species. Its dominance in certain areas has effectively reduced the landscape value of our area.

In order to familiarise residents with this topic, we organised a meeting with Wojciech Solarz (associate professor at the Institute of Nature Conservation PAS, member of the Scientific Forum on Invasive Alien Species at the European Commission since 2015). The meeting was very intimate, which only shows how many more awareness-raising and educational actions we still have to carry out.

It seems that the only way to reduce the range of invasive alien species will be to educate local people and engage them to reduce the presence of these species.

What are our plans?

- involve schools in pulling out plants before the seeds are released
- encourage residents to plant native perennial species and shrubs.

We are curious to see how European geoparks deal with these species - already widespread in Europe of our climate zone, after all. We hope to be able to exchange experiences in this field as part of our cooperation on the preservation of primary biodiversity.

Keywords: natural hazards, invasive alien species, biodiversity

References: Barbara Tokarska Guzik, Wojciech Solarz et al. *Project No. POIS.02.04.00-00-0100/16-00 entitled Developing principles for the control and eradication of invasive alien species together with pilot actions and public education.* General Directorate for Environmental Protection 2016-2023.

MULTIDISCIPLINARY STUDY OF THE CAMPOCATINO BASIN: POPULARIZATION OF A GLACIAL GEOSITE IN THE APUAN ALPS UNESCO GLOBAL GEOPARK

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The Campocatino glacial geosite is an amazing example of the glacier activity developed during the *Last Glacial Period* in the Apuan Alps. This contribution aims to provide a geological and paleo-environmental model, resulting from a multidisciplinary study that integrates sedimentological analysis, radiocarbon dating and paleobotanical analysis. The sedimentary fill of the Campocatino basin is represented by glacial till deposits, resedimented during the Holocene after a short transport due to surface runoff. These sediments consist of clayey silts and gravelly sands, with granules from metamorphic rocks (phyllites), associated with quartz crystals and iron-manganese nodules. Widespread charred and vitrified plant remains are found. Radiocarbon datings on the remains of vegetable organic matter provided ages ranging between 4,523 years and 3,477 years ago. Palaeobotanical analyses have made it possible to attribute the charred plant remains to a single species of conifer consisting of the silver fir (*Abies alba* Miller). After the glacier retreat during the Holocene Climate Optimum, Campocatino hosted a forest composed almost exclusively of the majestic silver fir. The charred and vitrified remains of Campocatino probably testify one of the first significant human impacts on the environment in the Apuan Alps. During the Bronze Age, in fact, the populations present caused intentional forest fires, in order to obtain pastures and fertilizing soils.



Currently the glacial geosite of Campocatino can be classified as a complex glacial geomorphosite and is characterized by a large depression, interpreted as an overexcavation basin that ends in its front part with the typical arched shape. In this spectacular natural amphitheatre, a panel was installed to illustrate the evolution of the glacier of Campocatino, with the aim of enhancing the glacial geosite, popularizing the ice age in the Apuan area and preserving the geodiversity of the Global Geopark.

THE GEOLOGICAL WONDERS OF THE ASPIRING UBERABA GEOPARK : LAND OF GIANTS

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The Aspiring Uberaba Geopark encompasses the entire area of the homonymous city, covering approximately 4523 km². It is located in the region known as *Triângulo Mineiro*, which is the western part of the Minas Gerais state in Southeastern Brazil. Uberaba has a population of around 340,000 people and is centrally located within a radius of about 500 km from Belo Horizonte (the state capital), Brasília (the federal capital), and São Paulo (the largest and wealthiest city in Brazil), and it serves as an important logistics hub for Southcentral Brazil. The predominant biome in the territory is the *Cerrado* (Tropical Humid Savanna), a phytogeographic unit characterized by distinct wet and dry seasons. Uberaba is known for three main attractions, dubbed "giants," which draw visitors from both national and international locations: the zebu cattle herd, the medium Chico Xavier, and its geodiversity heritage, particularly its dinosaur fossils. From a geological perspective, the Aspiring Uberaba Geopark currently consists of 31 geosites, encompassing paleontological, sedimentological, stratigraphical, geomorphological, vulcanological, hydrogeological, mining, and geological built heritage. These sites span from the Lower Cretaceous to the Holocene. Within the territory, two unique Upper Cretaceous stratigraphic units, the Uberaba (Campanian) and Serra da Galga (Maastrichtian) formations, provide insights into the evolution of distinct Gondwanan environments and paleobiota. Dinosaurs are iconic figures in paleontology, and Uberaba is no exception. The region is home to various titanosaurs, including egg clutches and *Uberabatitanribeiroi*, the largest dinosaur found in Brazil. These fossils hold great significance within the local community. Visitors can experience these fossils and the paleontological heritage of Uberaba at the popular Peirópolis geosite, which attracts a large number of visitors each year. Another notable geological feature in Uberaba is the presence of the Serra Geral Formation. These basalts were formed during the opening of the South Atlantic Ocean and serve as the basement for the Upper Cretaceous sedimentary filling, and is exposed in numerous waterfalls throughout the region. Furthermore, the Aspiring Geopark Uberaba boasts limestone mining activities that have been carried out since the early 20th century. The history of this mining activity can be observed at two geosites, which hold both mining and historical-cultural significance. The sites within the Aspiring Uberaba Geopark attract tens of thousands of visitors annually, who come for educational, leisure, culture and nature-related purposes. The geodiversity of Uberaba, particularly its fossils, plays a crucial role in the socioeconomic and cultural development of the community, providing employment opportunities and wealth, where geotourism serves as a transformative paradigm in this regard. With the prospect of being recognized as a UNESCO Global Geopark, we anticipate an even greater influx of visitors.

PROMOTING GEOSCIENCE EDUCATION AND HERITAGE CONSERVATION : THE CASE OF ASPIRING UBERABA GEOPARK

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A multidisciplinary team from various public and private educational institutions collaborated to disseminate knowledge about local geosciences to over 40,000 students in the basic education network² at the territory of the Aspiring Uberaba Geopark. The team also provided training for nearly 3,000 teachers in the municipality, supported scientific research in higher education, fostered partnerships among institutions, and organized events, courses, and workshops in non-formal settings to promote heritage education. An environmental education program was integrated into the Action Plan, involving geoscientists, educators, pedagogues, managers, and other professionals. The main outcomes of these efforts included presentations, exhibitions, live events, lectures, and workshops about the Aspiring Uberaba Geopark in municipal schools at various education levels. The program aimed to raise curiosity about geosciences, generate interest in geological and cultural sites, and contribute to geoconservation initiatives. Additionally, specialized courses on entrepreneurship and innovation were offered to teachers, leading to the Entrepreneurship and Innovation Olympics involving students from participating public schools. Non-formal educational spaces such as the *Museu dos Dinossauros/UFTM* (Dinosaur Museum) and the *Museu do Zebu/ABCZ* (Zebu Museum) hosted events, courses, and workshops, attracting thousands of visitors, especially school children. University extension and research projects related to the Aspiring Uberaba Geopark were supported, resulting in several initiatives aligned with the Sustainable Development Goals (SDGs). The educational products developed included board games, didactic materials, and publications. Higher education institutions actively participated through undergraduate teaching, involvement of students in research projects, and the development of master's dissertations. Collaboration with the *Companhia Operacional de Desenvolvimento, Saneamento e Ações Urbanas/Codau* (Uberaba Development and Sanitation Operational Center) facilitated environmental education programs, reaching a significant number of students. Partnerships with the *Serviço de Mídia em Extensão e Educação/UFTM* (Media Service in Extension and Culture) and the *Departamento Municipal de Educação* (Municipal Department of Education) supported the dissemination of geoproducts and events. A Tourist Information Agent Course, conducted in partnership with the *Serviço Nacional de Aprendizagem Comercial/SENAC* (National Service for Commercial Learning), aimed to train professionals to provide tourist information and support activities related to the Aspiring Uberaba Geopark. Overall, these efforts have contributed to promoting geoscience education, heritage conservation, and sustainable development within the territory.

MAJELLA UNESCO GLOBAL GEOPARK, A LABORATORY TO ACHIEVE SUSTAINABLE DEVELOPMENT PROJECTS

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The MaiellaUGGp area has some many characteristics which consist in the overlapping and coexistence of the geological, natural and anthropic spheres. The processes underlying the sustainable management of the Maiella Geopark study, research and analyse the linking relationships between these elements that coexist in a holistic way in the territory. The key to interpretation is in understanding how these factors influence each other and above all in understanding the different evolutionary "speeds": geological times, the life cycles of plants and animals and human presence. The landscape is the synthesis of these factors and translates into a peculiar diversity: on the one hand the bare, lunar landscapes of the high altitudes, gorges, valleys, on the other the human being who has superimposed himself on the canvas painted by nature and geology on which it has acted by modifying the landscape, which has been cultivated, grazed, excavated, rebuilt, explored with oil wells.

The governance and management of knowledge deriving from the research and monitoring projects implemented, analyses the dynamic processes between all those elements and has an acquired heritage as a basis, which today becomes a dynamic heritage capable of generating an economy for the local population in a sustainable way. The sustainable governance is based on projects that protect and enhance biodiversity such as the project "Floranet - Safeguard and valorisation of the plant species of EU interest", the Life stream project, the "LIFE ARCPROM – Welcome back gentle bear" which aims to improve the coexistence between brown bears and humans, the "LIFE Coornata project: development of coordinated protection measures for Apennine Chamois". The protection of biodiversity implies the protection of the geodiversity and geosites: for this reason the governance enhances the geoheritage through specific management actions that derive from European projects such as Interreg V-B "Adriatic caves", aimed on the one hand at promoting the sustainable use of the speleological heritage of its territory, on the other at increasing the effectiveness the conservation of the cave habitat (about 115 karst cavities surveyed in the territory of the Maiella Geopark).

There are many projects concerning the history of humans in the Maiella UGGp, such as the Maiella Rock Art Project, for the rediscovery and preservation of the prehistoric cultural heritage in collaboration with the Université Côte d'Azur of Nice and the Superintendency of Archaeology, Fine Arts and Landscape, and with projects regarding the hermitism carried on with researchers from the Muséum national d'Histoire naturelle. The Geopark implements a series of activities capable of creating a network for sharing those values and that environmental and cultural heritage, such as the creation of paths that link the various hermitages (about 20 hermitages surveyed, which are also geosites), such as the Path of the Spirit, the Trail of Pope Celestine the Fifth. Even the phenomenon of brigandage is today the object of valorisation and promotion, and organizes studies, research and thematic itineraries, as well as the whole history linked to mining exploration which involved the portion of the northern sector of the park, where over a hundred mines, some of which are now geosites and connected with the geotrail "the miners' path". On the eastern side of the MaiellaUGGp, the geotrail dedicated to the places and stories of the Second World War is being created, with the Gustav Line path, which crosses the villages that were on the front line between the Germans and the allies, and will also highlight the stories of the men who lived in those countries, the cradle of the partisan resistance struggle.

Key words: MaiellaUGGp, geopark, UNESCO, Geotrails, geosites, governance

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MARINE SPATIAL PLANNING AS A KEY OF SUSTAINABLE MANAGEMENT OF THE BELITONG GEOPARK IN INDONESIA

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Belitong Geopark is one of the 6 (six) UNESCO Global Geoparks that have been established in Indonesia. This Geopark has a complete coverage area which is both land and sea waters. Within the Belitong Geopark coverage area, there are several Geosites lying in marine waters which has become the main attraction for visitors and tourists when visiting Belitong Island; such as Geosites in Tanjung Kelayang and Kuala Granite. In an effort to develop the utilization and management of the marine geosites in sustainable goals, an arrangement needed to regulate and minimize other marine space utilization activities that can directly or indirectly have impacts to these geosites, for example such as mineral mining and reclamation around the geosite. The purpose of this paper is to provide an overview of the importance of marine spatial planning (MSP) in the sea waters around the Geosite within a Geopark. By doing so, the purpose of the Geopark establishment and its main elements of development is still be aligned, balanced and sustained for the community. The approach in planning the marine space around the Geosites is by defining the water area around them as the main zone. The main zone is the area that should be protected from the negative impacts of the marine utilizations through changes in the water hydro-dynamics and morphology of the coast. The main parameters in calculating the main zone is the water depth and the distance from the geosites. A depth of 20 meters and a distance of 2 miles from the geosite is considered safe from the effects of changes in the hydro dynamics of the waters. Beside the physical considerations, the development of MSP for Belitong Geopark also takes into account inputs from relevant stakeholders. Thus, this paper will provide the idea of how the MSP spatially drawn into zones and followed by their zoning regulations.

DEVELOPING A COMMON APPROACH TO THE GEOCONSERVATION OF KARST HERITAGE IN UGGP.

DELABY Serge

The karstic heritage of the FamenneArdenne UNESCO Global Geopark is the most important geological feature of the territory (Verheyden, 2016).

At a time when global environmental issues make it necessary to rethink our lifestyles and human nature relationships, it is very relevant to examine the ways in which caves and karst areas are used through the concepts of resource and heritage.

Good management of heritage and resources both demands and ensures environmental protection (Gunn et al 2022).

In Belgium, environmental protection is a regional competence.

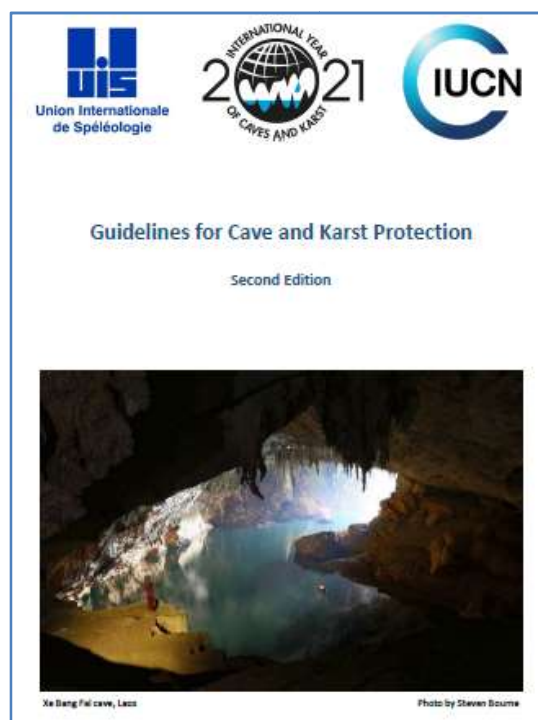
For Wallonia, the Nature Conservation Law and the Walloon Code of Town and Country Planning, Heritage and Energy legislate this matter (Michel et al, 2015).

On the field, scientists and cavers are uniting their efforts to preserve the karst. Our Geopark is contributing to this eco-responsible attitude on several levels:

- Visitors
- show-cave manager
- Scientists
- Political decision-makers

There are several international associations for the protection of karst. The main theme of the last International Union of Speleology congress was the Karst Heritage and Resources symposium, with a special session dedicated to karst in UNESCO-labelled areas (Delaby et al, 2022). A recent publication revealed that karst areas had been identified in 151 Biosphere Reserves (MAB), 72 UGGp and 76 World Heritage Properties (Gunn, 2022).

The second edition of the guidelines for the protection of caves and karst was published during the International Year of Karst with the support of the IUCN. This document should be considered as a reference in karst conservation and fully shared within the GGN Geoparks.



UNESCO GLOBAL GEOPARKS YOUTH FORUM : YOUTHS ROLES FOR THE SUSTAINABILITY OF GEOPARKS

Deo Immanuel

The inaugural UNESCO Global Geoparks Youth Forum (UGGpYF) took place in Jeju Island UNESCO Global Geopark (UGGp), South Korea, in December 2021. Indonesia was chosen to lead the forum in two years' time. The forum's objective is to promote youth as significant participants in geoparks, both locally and globally. Its mission is to empower youth as agents of change, collaborators, and innovators for the sustainability of Global Geoparks. Regarding Indonesia's leadership in the forum, UGGpYF collaborated with the Indonesian Geoparks Youth Forum (IGYF), under the direction of the Ministry of National Development Planning (BAPPENAS) of the Republic of Indonesia, to design a five-year framework to connect youth. The following initiatives were undertaken:

A) Development of a website called **Geoparks Youth Hub** (submitted as a paper and presented during the DIGITAL 9th International Conference on UNESCO Global Geoparks): This web-based platform (geoparksyouth.net) aims to connect youth within geoparks worldwide. Youth can register and share information about local community activities, events, and job vacancies across geoparks.

B) Organization of the **Introduction to Geoparks Webinar** in collaboration with UNESCO, the Global Geoparks Network, UGGpYF, and IGYF: This webinar had three objectives: a) launching a new, long-term journey for youth engagement in geoparks, b) establishing a coherent organization involving stakeholders, and c) sharing Indonesia's successful experience in connecting youth across geoparks.

C) Presentation of chairperson on **Youth Role for Geoparks Sustainability**, in Asia-Pacific Geoparks Conference, in Satun, Thailand in September 2022: He presented as keynote speaker, introducing the strategic map of Indonesia in accordance with youth to support government in establishing Geopark Action Plan.

D) Organization of the **1st UNESCO Global Geoparks Youth Forum Seminar and Camp** in Batur UGGp, Bali, in September 2022: This event was integrated with the G20 Indonesia Presidency as a side event. Youth from all countries with UGGps and Indonesia discussed the theme "Youths for Climate Action in Geoparks" and produced a commitment document on climate change and geoparks known as the Batur Charter. It represents the first international youth commitment to actively support climate change adaptation.

E) Organization of the **Volcanic and Spice Youth Festival (VOLCEST)** in collaboration with the Ternate Geopark Youth Forum (TGYF) in December 2022: The event was aligned with the local government's long-term program on urban planning. This initiative aimed to continue youth commitment to supporting volcanic geoparks and educating them on natural disaster mitigation. The Ternate Charter was produced as an outcome.

F) Organization of the **UNESCO Global Geoparks Youth Marine Camp** in Belitong UGGp in July 2023: This event was integrated with the ASEAN Blue Economy Forum as a side event, focusing on the theme "The Way of Water." Youth, particularly from the Asian region, gathered and produced the Belitong Declaration of Sustainable Island Geoparks. This represents the third youth commitment to supporting island geoparks and promoting the conservation of seas and oceans.

In conclusion, these five points demonstrate the strong commitment and leadership of the first UGGpYF presidency. It is hoped that all UGGps, National Geoparks, and Aspiring Geoparks worldwide recognize the hard work and efforts put into **establishing their own Youth Forums** and strive to connect locally and regionally through the Regional Geoparks Network. The **commitment of the management body and national geopark networks** is crucial to stimulate, nurture, and develop local youth as the main actors in leading and promoting geoparks within their respective areas, thus contributing to sustainable economic development for their communities. It is strongly believed that through a bottom-up approach, sharing, and networking with UGGpYF, the immense impact of youth creativity will be multiplied further.

Keywords : Youth, UNESCO Global Geoparks Youth Forum (UGGpYF), Commitment, Sustainability, Youth Forum

SACRED TRIANGLE UNESCO GLOBAL GEOPARK PROJECT

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Sacred Triangle UNESCO Global Geopark Project (STUGGP) is in the State of Querétaro at central Mexico. It covers an area of 5,530 km². The geopark proposal was registered in 2019. The main characteristics of the STUGGP are its Geodiversity, Biodiversity and Culture. Geodiversity because it is located at the intersection of three major geological provinces of Mexico, Sierra Madre Oriental folded belt (Mesozoic), Sierra Madre Occidental ignimbrite range (Eocene-Miocene), and the Mexican Volcanic Belt (Miocene-Present). The geologic history of STUGGP starts with 250 Triassic marine sandstones of Pangea time, continue with Jurassic marine sandstones accumulated during Pangea break-up, and Cretaceous limestones and shales. At 80-60 Ma these deposits were folded and thrust during the Laramide Orogeny, creating the Sierra Madre Oriental range. After about 20 Ma, gigantic explosive super-eruptions from calderas produced large-volume silicic ignimbrites at 38 to 22 Ma, forming the Sierra Madre Occidental range, considered the largest of its type in the world. The southernmost portion of this range is within the STUGGP, with giant ignimbrites with tall columnar prisms. Volcanism drastically changed at 12 Ma, with the formation of andesitic stratovolcanoes that marked the initiation of the Mexican Volcanic Belt province which continued until about 5 Ma within the STUGGP, forming a variety of volcanic features, such as calderas, cones, and domes, such as Peña de Bernal monolith, a spine-type dacitic dome that outstands in the landscape, unique in its type.

Biodiversity is also relevant, with several ecosystems caused by the geological variety and the ranges and valleys formed during long-lasting building and erosional processes, resulting in deep canyons with elevations of 800 meters above sea level (masl), plains at about 1800-200 masl, and high ranges up to 3,280 masl. Thus, there are tropical low altitude flora and fauna, semi-arid cactus-rich widespread zones, and highlands with pine and oak dense forests.

Culture is based on the Otomi-Chichimeca people that lives within the STUGGP. This original culture dates to pre-Hispanic time, which with Catholic religion introduction during Spanish Colonial time, it was created a unique syncretism of different worlds. At many sites within the STUGGP Otomí-Chichimeca people still speaks N̄hañhú, their native language. They are rich in festivities and celebrations that combine their cosmovision with the Catholic religion. These living memories are already part of the UNESCO World Cultural Heritage Sites. Besides, the STUGGP includes two well-preserved archeological sites, Ranas and Toluquilla, which are managed by the Archeological National Institute.

The name given to this geopark project, Sacred Triangle, refers to the Otomí-Chichimeca people cosmovision of three sacred mounts in which they continue doing celebrations with profound meanings. These mountains represent also the Geodiversity of this region: Frontón Mount at the east, composed of Triassic folded sandstones, the oldest rocks in the geopark; Zamorano Mount at the west, the highest peak in the state, made up of Oligocene giant silicic ignimbrites at the base and an andesitic Miocene stratovolcano at the upper part; and Peña de Bernal at the south, a prominent rock formed as a spine volcanic dome at 8.7 Ma that intruded Jurassic and Cretaceous marine folded rocks.

INTERNATIONAL VOLUNTEER PROGRAMME "KULTURWEIT" FOR UNESCO GLOBAL GEOPARKS

Katharina Dietrich, *Programme Specialist kulturweit, German Commission for UNESCO*

The German Commission for UNESCO organizes an international volunteer programme called "kulturweit" (<https://www.kulturweit.de/en>), funded by the German Federal Foreign Office. In the framework of this programme, young volunteers from Germany are sent to UNESCO designated sites all over the world, a lot of them to UNESCO Global Geoparks.

Through their voluntary commitment in the international network of UNESCO designated sites, the volunteers support the work of UNESCO in their host sites. They can contribute to implementing selected projects which suffer from a lack of personnel resources: Possible tasks are supporting educational work, working with youth, supporting the organization of events, conducting guided tours, working with local communities, supporting research and monitoring, supporting office work, or simply bringing intellectual and youthful input to the work of the host site.

This way, kulturweit offers young people an intensive educational and intercultural experience. Through their work abroad volunteers develop not only their cultural competencies, but also make an important contribution to the target stated in the UNESCO charter "to develop and to increase the means of communication between peoples and to employ these means for the purposes of mutual understanding."

The volunteers support the work of the Geoparks for six or twelve months. All costs, such as health and social security insurance, travel costs, pocket money, and a language course, are covered by the German Commission for UNESCO.

By presenting this volunteer programme at the 10th International Conference on UNESCO Global Geoparks, we would like to give an inspiration for international exchange and youth work to representatives of Geoparks and National Commissions for UNESCO. At the same time, we would like to inform the participants about the possibility of cooperating in this programme by becoming a host site for volunteers.

CONNECTING UNESCO NETWORKS TO IMPLEMENT SDG4.7

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2. *Hellenic National Committee on Geoparks*

The Associated Schools Network (ASPnet, established in 1953,) is a UNESCO worldwide school network with a clear mandate to promote the ideals and values of UNESCO as a model in the field of international education. Today, 12.000 schools in 182 countries are committed to work through innovation and transformative learning experiences towards the implementation of SDG4.7.

UNESCO Global Geoparks (UGGp) established in 2015 in the frame of the International Geosciences and Geoparks Programme are single, unified geographical areas where sites and landscapes of international geological significance are managed with a holistic concept of protection, education and sustainable development. Today the Global Geoparks Network includes 195 UNESCO Global Geoparks in 48 countries committed to the implementation of the 17 SDGs

The Associated Schools Network in Greece and the Hellenic Geoparks Forum started their collaboration in 2018 aiming the broader utilization of the UNESCO Global Geoparks in Greece as learning territories for the implementation of education programmes and activities with an holistic approach on our planet and our natural and cultural heritage. The contribution of the UNESCO Chair on Geoparks and the sustainable development of insular and coastal areas at the University of the Aegean in Greece for the success of this collaboration was significant.

In 2022, ASPnet members worldwide were engaged in focus group discussions within the framework of the Futures of Education initiative, contributing thus to the global debate on how knowledge and learning can shape the future of humanity and the planet. The discussions raised a key issue: “education beyond the classroom, exposures, and actions, with learning environments that spread across home, schools, and communities”.

Education for Sustainable Development is one of the two priorities included in the network’s Strategy 2014-2021. One of the aims of the Strategy is to experiment innovative approaches on ESD through, among others, training and networking. For the effectiveness of the networks’ work, implementing whole-school approach (to stimulate both learning and practice) and strengthening the network through widened partnerships are suggested.

In this framework, taking into consideration the already impressive results of the collaboration between the two networks in Greece, we propose a closer collaboration between ASP netand UNESCO Global Geoparks (as places to implement Education for Sustainable Development) with the support of the relevant UNESCO Chairs. UNESCO networks collaboration will set a platform for outdoor school projects and actions, to fulfill the aims of the Strategy and Education 2030.

BOHOL ISLAND GEOPARK: A STRATEGY TOWARD RESILIENT, GREEN, AND INCLUSIVE DEVELOPMENT

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Situated in the central portion of the Philippine Archipelago, the island province of Bohol is home to magnificent geological and geomorphological features of international and national significance. Its geologic history is marked by periods of tectonic turbulence and occasional quiescence spanning nearly 150 million years in the making. Forming the island's basement rocks are the Alicia Schist and the Bohol Ophiolite, an exposed slice of an ancient oceanic lithosphere. The repeated cycles of emergence and submergence provided excellent conditions to form exceptional karst landscapes that gave rise to the formation of the famous Chocolate Hills, sinkholes, cave pools, and marine terraces.

The Boholanos' desire to protect and conserve its geological heritage, along with its natural and cultural heritage, led to its aspiration to become part of the UNESCO Global Geoparks Network (UGGN). Global Geoparks are important territories with sites and landscapes of international geological significance that are managed through a holistic community-led approach of combining conservation, education, and sustainable development.

The UNESCO Global Geopark principles perfectly harmonize with the provincial government's vision for Bohol Island to be a prime eco-cultural tourism destination and a strong, balanced agri-industrial island province, where local communities are proud of their heritage and committed to sound environmental management. As part of the local government's long-term Environmental Sustainability Roadmap 2023-2031, sustained international recognition of Bohol as a UNESCO Global Geopark is one of the key indicators of a resilient and green province.

The island province of Bohol is the first and only aspiring geopark from the Philippines to formally apply for this UNESCO designation since 2019. Despite its deferment for two years, the geopark team was more driven to improve the functions and operations of Bohol Island aspiring UNESCO Global Geopark as shown in the progress report submitted to UNESCO in 2022. The report was carefully reviewed and discussed during a GGN Council meeting that resulted in its nomination as one of the 18 new UNESCO Global Geoparks for the endorsement of the UNESCO Executive Board in May 2023.

Presently, the aspiring geopark continues to strengthen its management and functions through partnerships and collaborations with various public and private institutions and organizations, especially in the areas of research, education, tourism, and conservation of geological heritage. International collaboration through a UNESCO International Geoscience Programme Project is also among the efforts to improve the visibility of Bohol within the Network.

Keywords: Bohol, Geopark, resilient, green, sustainability

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SOME GEOLOGICAL FEATURES AND VALUES OF LANG SON GEOPARK

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Lang Son Geopark is an ancient land with a history of geological evolution at least about 500 Ma. There are all kinds of soil and rock here, from magmatic, metamorphic, and terrigenous to carbonate ones. Lang Son Geopark consists of 3 main structural units: 1). Bac Son Anticlinorium-Limestone block - where geological formations from Cambrian to Permian are exposed; 2). Song Hien hinterland rift-originated superimposed depression - where the early-middle Triassic geological formations are exposed, especially the co-sedimentary eruptive formations with the early Triassic acid composition; and 3). An Chau hinterland rift-originated superimposed depression - where geological formations from early Triassic to Paleogene are exposed, especially continental eruptive rock with acid composition aged J₃-K and continental volcanic eruptive rock with base composition age K-ρ. Along with the tectonic context, such a long, complex, diverse, and continuous geological evolutionary history is an equally long, diverse, and continuous life evolutionary history, leaving extremely rich sets of paleontological fossils such as Ammonites, Brachiopods, Bivalves, Anthozoans, Ancient Fishes, Foraminifers... Moreover, crossing both of the above-mentioned hinterland rift-originated superimposed depressions is the Cao Bang-Tien Yen deep shear fracture zone along which a series of Tertiary and Quaternary pull-apart basins such as Lang Son and Na Duong have been formed. Particularly, in the Na Duong basin, coal-bearing continental sediments of alluvial-lacustral-bog origin over 600m thick have been deposited with a rich and unique set of fossils of freshwater and terrestrial flora and fauna, including varieties/species of mollusks, snails, vertebrates such as fish, turtles, and crocodiles, and especially mammals such as *thú than*, rhinoceros, and primates..., traces of leaves, pollen spores, and especially fossil wood forests..., contributing to the reproduction of such a volatile tropical ecosystem approximately 40-20 Ma. that many scientists called it a "special window into the Eocene epoch from Southeast Asia". It is not surprising that Lang Son Geopark is also one of the oldest and most unique cradles of prehistoric people in the entire territory of Vietnam with archaeological relics and artifacts from about 500 Ka. (Homo Erectus remains), 125 Ka., 40, Ka., 10 Ka., 4 Ka. and continuously to the present day, including famous archaeological cultures such as Bac Son Culture (about 11-5 Ka.), Mai Pha Culture (about 4-3 Ka.), etc. Lang Son Geopark is currently home to 7 ethnic minorities with indigenous cultures imbued with their own identity and also shows a very unique interference between them and the Red River Delta culture with its famous Đạo Mẫu (the worship of mother goddesses). Lang Son Geopark will certainly be a very distinctive and worthy member of the UNESCO Geopark Network.

Keywords: Geopark, geological, geodiversity, geoheritage

MASS TOURISM IN THE DONG VAN KARST PLATEAU UNESCO GLOBAL GEOPARK, VIETNAM AND THE FIGHTING AGAINST IT

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Dong Van Karst Plateau Geopark (DVUGGp) was established in September 2009 and officially became a Global Geopark in October 2010. For 12 years of development, as the first Geopark in Vietnam, with great supports from international organizations, central agencies and local efforts, many achievements have been achieved in addition to many lessons learned. One of them is the lack of understanding of tourists on local ethnic groups.

One of them is the hard-to-control growth of mass tourism and the solutions to fight it

In this presentation, we would like to share some situations and methods used – going to use by the Geopark team to promote the development of sustainable tourism inside the territory.

The presentation will focus on three closely related issues:

- Heritage (both natural and cultural) conservation.
- Interests of and impact on local ethnic groups; and
- Our solutions.

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THE FIRST INTERNATIONAL GEODIVERSITY DAY IN THE AMERICAN UNESCO GLOBAL GEOPARKS

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The initiative of creating an International Geodiversity Day (IGD) came after the Geoheritage Virtual Conference, in 2020, where four of the conference delegates called for its establishment. After that, The IGD was proclaimed by UNESCO at the 41st General Conference in 2021. This annual event is celebrated on October 6th aiming to highlight the significance of geodiversity in our daily lives and to encourage people to take action to protect and conserve the Earth's geological heritage.

The day is celebrated with various activities, such as field trips, lectures, exhibitions, and workshops, organized by geological organizations, educational institutions, and conservation groups worldwide. In this sense, the participation of geoparks in the promotion of IGD is especially important since the conservation of geodiversity is one of their principles. Hence, this paper has the purpose of analyze the contribution of American geoparks to IGD, gathering data of activities, web posts and others. Considering that only 12% of 250 actions held in 2022, registered in the IGD website, were developed in America and Oceania, it is necessary to investigate how to enhance the participation of Southern Hemisphere countries to celebrate the importance of the geodiversity.

Therefore, the American UNESCO Global Geoparks (UGGps) was chosen to be analyzed in this paper. Thus far, the American continent has two UGGps networks: the Canadian Geoparks Network (CGN), established in 2009 and with 5 UGGps; and the Latin America and Caribbean Geoparks Network (GeoLac), created in 2016 with 10 UGGps.

Data from these 15 UGGps were collected from their social networks, like Facebook and Instagram, and subsequently their importance to each territory were analyzed. Regarding CGN, all UGGps have produced posts celebrating and explaining IGD. Percé, Stonehammer and Cliffs of Fundy UGGps had a collaborative activity, posting a video about their geoheritage. Only DiscoveryUGGp has realized a presential event, presenting their geofoods and geoproducts. The Tumbler Ridge UGGp presented their own geoheritage, geosites' photography's and explanations.

Regarding GeoLac, 60% of them developed some activities in their social networks. Kutralkura, Imbabura and Colca y Volcanes de Andagua UGGps did not publish initiatives, and Rio Coco UGGp doesn't have an active social network. All activities promoted are related to educational purpose, bringing youths and/or local community to present the local geodiversity. It is important to highlight the Indigenous People participation on the Mixteca Alta UGGp; Araripe, Seridó and Grutas del Palacio had an entire October calendar of IGD activities; The Grutas del Palacio UGGp participated of a collaborative action with other Global Geoparks Network, the IGD Digital Event.

As can be seen, the Canadian geoparks have developed an audiovisual approach to promote IGD. On the other hand, GeoLac geoparks demonstrate their role in educational initiatives, approximating community to geodiversity. It is clear that geoparks networks can encourage other territories to promote collaborative actions.

Key words: geodiversity, celebration, networks

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THE SERIDÓ UNESCO GLOBAL GEOPARK ON THE AGENDA 2030 IMPLEMENTATION: 2022'S ACTIONS IN A SUSTAINABLE TERRITORY

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The 2030 Agenda for Sustainable Development Goals of United Nations (SDGs) are the guidelines to implement sustainability in UNESCO Global Geoparks (UGGps). In this way, some geoparks and networks had been trying to understand what are themselves contributions for the 2030 Agenda. The Seridó UGGp is a territory recognized in 2022 and composed by Acari, Carnaúba dos Dantas, Cerro Corá, Currais Novos, Lagoa Nova and Parelhas municipalities, with a 2,802 km² area, inside the Brazilian Northeast semi-arid. Created in 2017, the Public Intermunicipal Consortium Seridó Geopark (PICSG) is the entity responsible to manage, within the local representatives, technical and scientific committees, and promote actions in favor of sustainable development for Seridó UGGp community.

The geopark stakeholders' perspective about promotion of SDGs was published in 2021, in this survey the highlight was in SDGs 17, 15, 4, 8 and 11. Although this, it is necessary expand this research and analyze through the 2022's actions applied in the territory to comprehend the SDGs' contributions to turn the geopark even more sustainable. In order to evaluate the SDGs was used the 2022's Report of Actions of the territory, that compiled all the activities promoted along this year, especially registered in the geopark's social networks. To comprehend the impact of each SDG implementation inside the Seridó UGGp's actions, each initiative registered in the report data was classified according your SDG main purpose, e.g. geoeducational event in a school for SDG 4, or partnership with artisans for the SDG 8.

In 2022, the Seridó UGGp staff developed in favor of their territory 230 different activities, an average of 14 initiatives per month. The most implemented goals were the SDGs 4 (37%), 8 (19,6%), 17 (14,3%), 9 and 11 (6% each one). In this SDG, it can be highlighted the educational major project "Five senses of Seridó Geopark" with many planned actions during the year. For the second most implemented goal, the 8th one, there are some initiatives, such as: meeting with government representatives, stakeholders, geopark's staff, another geoparks and partners; release and idealization of touristic programs; consortium general assemblies; regional and national tourism expeditions; forum and fairs participation; touristic signs project; nature documentary record; and geotourism local guides formation.

The others SDGs also were promoted in the territory, as the 17th in the media participation, partnerships and integration with another sustainability actor, and e.g. the 9th and 11th implementation with entrepreneurship events participation and execution of "Seridó Geopark Leaderships" territorial program of development. It is possible group the actions in two main blocks. The first one with a major peak of activities on the SDGs 4, 8 and 17 in a range of 14-37% of all initiatives. The other block with SDGs 9, 11, 12, 13 and 16 performed a similar 3-5% average. The analysis suggests a future targeting of actions in the second block and also the SDGs 1, 2, 3, 6, 7, 10, 14 and 15. This methodology could be applied as way to monitor the SDGs implementation in the Seridó and others geoparks territories.

Key words: monitoring, sustainability, management

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GEO-EDUCATION WITH SIMPLIFICATION OF SCIENTIFIC KNOWLEDGE FOR THE PUBLIC AND SUSTAINABLE DEVELOPMENT: THE CASE OF THA CHANG COMMUNITY, KHORATUGGP, THAILAND

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The discovery of numerous fossils in the KhoratUGGp territory is an impressive scientific accomplishment. More than 40 species of vertebrate fossils have been found in Tha Chang Subdistrict, ChaloemPhra Kiat District. The unconsolidated sediments were deposited in the sandpit along the Mun River of ChaloemPhraKiat District and largely comprised of gravel, sand, and mud alternated. The Mioceneto Pleistocene vertebrate fossils has been identified across the sediment strata. Mammalian fossils are the mainly fossil materials in the sand pits, especially ten proboscidean genera. There have been several scientific publications about the fossil from a couple of decades ago until now. The perception of those published writings is mainly shared among academicians; it is rarely shared with the general public, especially the local community. The abundance of fossils found at KhoratGeopark encourages the utilization of this potential to support educational initiatives and sustainable development. Tha Chang community base is a farming community. KhoratGeopark worked with the community in 2017 and provided knowledge about their famous fossils, particularly the ancient elephant, through several workshop activities. As a result, the first group of community enterprises in the KhoratGeopark area was established. There has been a boat trip along the Mun River with activities and community geo-products since 2019 and the newest group in 2022, with the first group being a bag processing group from woven reed mats. The dye mimics the pattern of the sediment layer on which the fossils were deposited. From the business, there is additional income for the group that amounts to 25.40% of the main income. In the second group, it is the weaving of cotton and woven reed mats, emphasizing the pattern of ancient elephants, and the processing of bags, shirts, scarves, etc. Although it was just established in November 2022, its performance has seen many pre-orders come in and generate additional income of 1,226.17 USD. Additionally, the community's way of life has evolved from private living to reunion, where people engage in activities, talk, and eat meals together. This leads to an increase in their shared understanding.

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A TOURISM ROUTE CONNECT NON NUOC CAO BANG UGGP AND DONG VAN KARST PLATEAU UGGP, AN EXAMPLE OF COOPERATION BETWEEN GEOPARKS

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Non nuoc Cao Bang, a remote area in North Viet Nam, possesses exceptional geological heritage, beautiful pristine landscapes, biodiversity, lots of tangible and intangible cultural heritages and well-persevered traditional cultures of ethnic groups. The UNESCO Global Geopark designation in 2018 was the evidence of the potential and efforts of Cao Bang in protecting, conserving heritages and has been assisting Cao Bang on the way to achieve sustainable development. In the Geopark action plan, sharing experience and cooperation with other Geoparks is one of fundamental aspects.

Non nuoc Cao Bang covers a total area of 3.683km², spreading over Cao Bang city, total area or part of 7 out of 9 districts of Cao Bang Province. Since the establishment of the geopark, we have been attempting to implement different solutions to protect, preserve and promote the heritage values in Non nuoc Cao Bang UGGp territory towards sustainable development. Non nuoc Cao Bang Geopark neighbours Dong Van Karst Plateau Geopark. The initiative of creating a tourism route connecting the two Geoparks aims at optimizing advantages of the two Geoparks, mutual promotion and, strengthening the conservation and promotion of heritages and increase livelihood for the populations out of the Geopark territory.

This presentation will clarify the experience sharing and collaboration and effect of the two Geoparks to implement the initiative of the connecting route as a solution for the networking and cooperation among Geoparks.

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THE GEOHERITAGE OF THE SOUTH-EASTERN FRONTAL ZONE OF THE MIDDLE ATLAS (MOROCCO): FIRST INVENTORY, ASSESSMENT AND CARRYING CAPACITY

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The southeastern frontal zone of the Middle Atlas Mountains serves as a natural barrier, dominating the Middle Moulouya plain. This area is characterized by the anticlinal ridge, which is the southernmost and highest section of the Middle Atlas. It prominently features the Jbel Bou Naceur, a peak that reaches an elevation of 3326 meters, as well as Jbel Tsiouant, which stands at 2467 meters. The Jbel Bou Naceur holds a unique high-mountain ecosystem with abundant biodiversity, leading to its designation as a Site of Biological and Ecological Interest. Composed mainly of limestone, dolomite, and marl deposits from the Jurassic period, this region's landscape has been shaped by tectonic activities and erosion, resulting in striking geological formations.

Our study's primary objective is to conduct an initial inventory and assessment of geosites and geomorphosites spanning from Jbel Tsiouant to Jbel Bou Naceur. This process involves classifying and cataloging these sites using a novel assessment approach that amalgamates recent methodologies, adapted to our specific project. A total of eleven geosites and eleven geomorphosites were meticulously chosen for inclusion. For each site, we meticulously evaluate its scientific, educational, geotouristic, ecological, cultural, and aesthetic values, its potential for various uses, and the risk of potential degradation. Among these sites, only one has undergone an assessment of its capacity for tourist visitation. The overarching aim of this approach is to facilitate interpretation, laying the groundwork for future geoconservation efforts (Ech-charay et al., 2022).

This work contributes significantly to the preservation of the abundant geodiversity in the region. Furthermore, it serves as a potential database that can be utilized for an impending Geopark project that national and regional authorities intend to establish within the Middle Atlas Mountains.

EVALUATION AND VALORIZATION OF GEOHERITAGE: CASE STUDY OF IDA MADRA GEOPARK (TURKIYE)

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Conservation and local development are among the main objectives of geoparks. The most important elements of geoparks are geoheritage sites. These may include geological, geomorphological, natural and cultural elements.

The geosites in the Ida Madra Geopark, which has very rich areas in terms of geology and geomorphology, are of great importance in terms of geoheritage potential. It is understood that the areas that did not have tourism potential before will make a significant contribution to tourism by evaluating and valorization.

The aim of this study is to evaluate the geosites that have little or no importance in terms of tourism before and to contribute to the development of the local people by increasing their importance.

The study consists of primary and secondary data. First, a field study was carried out to determine the geosites selected in the Geopark area and how they would gain value. The geological, geomorphological, cultural and natural characteristics of the areas were examined and each was scored according to the evaluation criteria. Then, based on the findings, geology, geomorphology and tourism maps were created. In the next stage, it was examined how to open the sites to tourism in order to help the development of the local people and what needs to be done was determined. At the end of the evaluation, it was determined how to eliminate the deficiencies of geosites with low scores. In the last stage, the rehabilitation, infrastructure and trekking routes of the site were built; place, direction and information signs have been prepared and placed in appropriate places. As a result of these processes, it was seen that the number of visitors in the geosites increased between 100-1000% in one year. The largest increase was recorded in the Hisaralan Travertine field geosite. Later, an increase in the number of visitors was observed in Hasanboğuldu and Sutüven waterfall, Şahindere Canyon Glass observation terrace. A similar situation has emerged from İvrindiGökkemer, Ayvalık Cleopatra Coastal geosites.

The results obtained showed that the areas that are less valuable in geoparks can be developed and become more valuable and promote to the local people through geotourism.

"LIVING WITH VOLCANOES: SHOWCASING THE RESILIENCE AND PREPAREDNESS OF REYKJANES GEOPARK THROUGH AN INTERACTIVE EXHIBITION"

Daníel Einarsson

This abstract outlines the development of a visitors centre exhibition focused on the response to earthquakes and volcanic eruptions, with a specific emphasis on the importance of civil protection, search and rescue squads, civil engineering, and the community of Reykjanes.

The ongoing volcanic activity in Reykjanes creates a new reality for the residents, but it can be said that a new period of volcanic activity has begun in Reykjanes, and it is therefore appropriate to educate and prepare the residents and future generations about their reality in an active volcanic area.

The community of Reykjanes Geopark has a varying relationship to the geological activity in the area. There is a sense of unease in some parts of the community and longing for information never time there is volcanic or seismic activity.

The sense of unease emerges from a lack of information about what to do in case of an emergency and what procedures are in place, as well as the role of the civil defence and other first responders.

This exhibition aims to calm these anxieties meanwhile creating an exhibition that lends itself to revisits for local families. The goal of this exhibition is to make a memorable unique experience of recent and future volcanic activities in Reykjanes Geopark, which is embraced and used as a go-to place by the local community.

The exhibition aims to educate and engage visitors by providing a comprehensive understanding of the challenges posed by these natural disasters and showcasing the critical role played by communities and responders in mitigating their impact. It will bring geological activity to life for visitors of all ages and provide a feeling of magnitude to the natural forces at work.

It was chosen to incorporate the local people in the preparation and concept design of the exhibition to better understand the local people's experience with the current eruptive series. Throughout the eruptions, Reykjanes Geopark collected stories, images, and videos for the exhibition and collaborating with a leading exhibition design firm in Iceland to create a rare and significant exhibition for residents and visitors to the region.

IMPACT OF CLIMATE CHANGE ON WATER RESOURCES OF GEOPARK M'GOUN: A CASE STUDY OF THE BIN EL OUIDANE DAM.

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In recent years, global warming has swiftly affected the world, particularly countries located in the southern and eastern regions of the Mediterranean Basin. These changes have had far-reaching effects on various crucial environmental facets, encompassing biodiversity, snow cover, and water availability.

The M'goon Geopark is located in the Beni Mellal Khénifra region, the latter of which is considered as one of the regions most vulnerable to the effects of climate change. This geopark encompasses a safeguarded zone comprising numerous exceptionally significant geosites, alongside substantial water resources, including the Bin El Ouidane dam.

The aim of this study is to evaluate the impact of climate change on the water inflow of the Bin El Ouidane dam, utilizing statistical data covering a three-decade span (1990-2020). Analysis of the Standardized Precipitation Index (SPI) values over 6 and 9-month intervals exposes a notable rainfall deficit within the study area.

Moreover, upon scrutinizing the results of the Mann-Kendall test, it becomes evident that both the annual and seasonal average ambient temperatures have displayed an upward trajectory. Through the application of linear regression and Kendall's tau, the correlation and relationship between temperature, rainfall, and water inflow have been probed. The findings establish a strong dependence on rainfall for the water supply to the Bin El Ouidane dam, while indicating a lack of correlation between temperature rise and dam inflow.

M'GOUN UNESCO GEOPARKS (CENTRAL HIGH ATLAS, MOROCCO), A LEVER FOR SUSTAINABLE AND INTEGRATED TERRITORIAL DEVELOPMENT: WHAT APPROACH TO ADOPT?

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The diversity of Morocco's geology and its geomorphology constitutes a fundamental element in the diversity of its mineral landscapes. This geodiversity, coupled with a wide range of bioclimatic domains, explains the geoheritage diversity seen in all regions of the country, which can also constitute territories where the concept of the geopark can be applied and developed. The different geological and geomorphological landscapes of the country testify to a very ancient and remarkable evolution of the Earth and the climate. An evolution that goes from the Archean to the Quaternary, 2.7 billion years of geological history of the country. Morocco is indeed a veritable geological and geomorphological museum.

This diversity and richness of geoheritages creates for our country an opportunity to foster geoparks which can contribute to the promotion of geotourism and environmental education and thereby to the socioeconomic development of the territories.

Geoparks, as an innovative idea for the protection of natural and geological heritage, play an important role in the development of geotourism. While developing geotourism, the creation of geoparks can generate new job opportunities, new economic activities, and additional sources of income, especially in rural and mountain areas. It encourages the production of local products and local crafts involved in geo-tourism and geoproducts (Gray, 2004, Neda Torabi Farsani et al, 2011).

This conference aims to show i) the experience of the UNESCO Geopark of M'Goun, the first geopark labeled in Africa and the Arab world, as a new philosophy of territorial development, ii) the approach to be adopted for sustainable and integrated development

THE PHCT M'GOUN-BAUGES SCIENTIFIC PROGRAM: CROSS-VIEWS ON GEOSITE MANAGEMENT AND THE MOBILISATION OF LOCAL STAKEHOLDERS IN THE GEOPARKS OF M'GOUN (MOROCCO) AND MASSIF DES BAUGES (FRANCE).

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In 2019, two UNESCO Global Geoparks, the Massif des Bauges in France, and the M'Goun in Morocco, engaged in a Franco-Moroccan decentralized cooperation project. The primary objective of this project is to promote and revitalize traditional activities in the mountain valleys of the respective Geoparks. These activities encompass various aspects such as the development of a milk industry to support local agriculture, assistance for craft cooperatives, sustainable geotourism initiatives, the establishment of geotrails for outdoor sports, and educational and scientific exchanges between students and academics from both territories.

As a complement and an extension to this cooperation programme between the two territories, a joint scientific research programme has been set up for the period 2022-2024 as part of the "Partenariats Hubert Curien" (PHC) scheme, and its Franco-Moroccan version "Toubkal" (PHCT). This project involves members of the scientific committees of the two Geoparks, researchers at the University of BeniMellal (Morocco) or Savoie-Mont-Blanc University (France), working previously respectively with the M'Goun and the Massif des BaugesGeoparks.

Entitled: "The geoheritage of the M'Goun UNESCO Geopark: a territorial resource for sustainable and integrated development", the project encompasses the study of the process of transformation of geoheritage into a sustainable territorial resource, based on a comparative approach between the M'Goun and the Massif des BaugesGeoparks, implemented through a PhD thesis in cotutelle.

The research work focuses in particular on 2 connected questions:

1°) Geosites as a territorial resource: which management?

2°) How engaging local stakeholders and people in the Geopark dynamics?

To provide some answers, these topics are studied by crossing field approach, directly on relevant geosites including interpretation centers, and surveys of local stakeholders and managers, using the same methodology and questionnaires for both Geoparks investigated.

Management tools are also covered, in particular GIS, with particular experience of geosite inventories, the essential basis for sustainable management of Geopark's geoheritage.

Furthermore, two "mirror" seminars about these issues were organized respectively at University Sultan Moulay Slimane of Beni-Mellal in November 2022 and in the Massif des BaugesGeopark on March 2023, providing a platform for discussions and knowledge sharing on the preservation and promotion of the geoheritage as a territorial resource within the two Geoparks.

Finally, the study aims to draw conclusions regarding the most effective techniques for managing geosites and mobilizing local stakeholders, based on the comparative insights gained from field visits and surveys.

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THE SACRO MONTE OF VARALLO (UNESCO WHL AND SESIAVAL GRANDE UGGP): WHEN ART AND GEOLOGY MERGE TOGETHER

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The Sacro Monte of Varallo (Varallo, Vercelli province, NW Italy) is one of the Sacri Monti (plural of Sacro Monte, Italian for "Sacred Mountain") of Piedmont and Lombardy (UNESCO WH sites) which are historical calvaries created in northern Italy since the 16th century. It is located in the Sesia Val Grande UNESCO Global Geopark, on a buttress of rock above the town of Varallo (600 m a.s.l.) and it is the oldest and the most important Sacro Monte of the alpine region. Its story begins at the end of the XV century, when the Franciscan friar Bernardino Caimi di Milano, on his return of the Holy Land, decided to reproduce the holy places of Palestine in Valsesia. The Sacro Monte of Varallo includes a basilica and forty-five frescoed chapels populated by over eight hundred statues. Connected by the steepest cableway in Europe, the site overlooks the historical centre of Varallo with its sumptuous monuments: the Picture-Gallery, the Museum of Natural Science and the Church of Santa Maria delle Grazie, painted by Gaudenzio Ferrari (1513). The Sacro Monte of Varallo is the most important of the pre-alpine Sacro Monte both for its artistic and historical significance and for its naturalistic makeup, rich in autochthonous and exotic plants arranged following the patterns of the Italian Renaissance gardens which aimed at emphasizing the nearby architectural structures. Although the territory has been profoundly altered by man, after years of gradual abandonment, the forest covering has slowly been returning floral elements that have developed and today accounts for more than 421 species. Inside the sacred area, the natural environment has been strongly shaped by man to resemble the typical gardens of Renaissance Italy. The area, characterized by a surface of 22 hectares, an elevation between 455 and 650 m a.s.l. in the environment of the mountain, features an "organ-pipe" wood of beech trees and some individual, centuries-old trees of various species.

The Sacro Monte di Varallo is a protected area of Regione Piemonte from 1980 and since 2012 it has been part of the Ente di Gestione dei Sacri Monti and "Sacri Monti UNESCO World Heritage Site". During the field trip at Sacro Monte di Varallo on the occasion of the 16th European Geoparks conference at Verbania (VCO province, NW Italy), an idea to enhance also the geological contents of Sacri Monti was born, in order to evaluate the importance of this geological heritage site.

The Sacro Monte di Varallo is located where the Canavese segment of the Insubric Line (a 1-km-thick mylonite belt that is a major tectonic boundary in the Alps) crops out. North and west of the Insubric Line, the Austroalpine Domain consists of piles of nappes, which were assembled and affected by a metamorphic overprint reaching eclogite facies during the Alpine orogeny. South and east of the Insubric Line, rocks of the Southalpine Domain were not affected by this metamorphic event and preserve an older history despite experiencing substantial Alpine tectonic deformation. These rocks originally belonged to the northern margin of the Adriatic plate, and within them an exceptional record of metamorphic and igneous events are preserved within a virtually intact section through the pre-Alpine crust that is the focus of the Geopark. Visitors can walk on fragments of sub-continental mantle, they can visit the contact between a massive gabbro intrusion and the rocks of the deep crust to see how they interact to generate granitic magma, they can also visit the roots and the roof of a granitic pluton and admire the chaotic breccias produced by explosive super eruption that formed a caldera at least 15-km in diameter.

Thrust-sheets of rocks that were stacked to form the Alps during the collision between Europe and Africa are wonderfully displayed along the lower Valsesia Valley, particularly in Varallo. To the northwest of the Canavese Line, the public can visit outcrops of high-pressure metamorphic rocks and fragments of the Tethys oceanic crust that once separated Europe and Africa. Some of these important rocks were used as ornamental stones for the construction and decoration of the chapels and the Basilica of the Sacro Monte di Varallo.

The work presents an overview of the main ornamental stones used at Sacro Monte in order to evaluate and enhance in a historical-cultural context. The study and analysis of stone materials in a historical-cultural context is therefore of fundamental importance for the enhancement of the territory, since the geological heritage is evidence of its history and material culture.

Key words: Varallo, UNESCO, Geopark, geology, ornamental stones

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URBAN SOLID WASTE MANAGEMENT IN UNESCO GLOBAL GEOPARK MIXTECA ALTA, OAXACA, MEXICO

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Every hour, every day, all over the world, waste is created. When it is not properly managed, it ends up in the streets, roads, parks, rivers, seas, or burned or buried in landfills, resulting in pollution of the air, water, soil and landscape, affecting the environment and the health of all living organisms, including humans. In México the constitution indicates that municipalities are responsible for waste management: from the collection to final disposal. However, municipalities in Mexico and in many Latin American countries are not able to provide this service, due to a number of factors such as the change of authorities every three years, discontinuity of projects, political disinterest, low budgets, inadequate infrastructure, and lack of environmental awareness in administration and society. In addition, waste brought in through commercial activity, such as plastic bottles and other packaging, has continually increased in volume, while the source producers of such waste have not necessarily invested in solutions. At present, most problem waste is produced outside the areas that have to deal with it.

In the UNESCO Mixteca Alta Global Geopark, approximately 3 tons of waste are generated daily in the nine municipalities that make up the geopark. For this reason, the Zero Waste Programme was created in 2021. It consists of a collaborative project governed by three strategic lines: providing environmental education on waste to all age groups (children, youth and adults); training municipal authorities in waste management; and creating links between authorities, the local population, businesses, institutions, civil organisations, and academia. Zero Waste is a lifestyle that implements daily habits and actions such as refuse, reduce, reuse, recycle and reincorporate, to try to send the least amount of waste to final disposal. The Zero Waste programme in Mixteca Alta relates to ten Sustainable Development Goals, among which are Goal 11 "Sustainable Cities and Communities"; Goal 12 "Responsible Consumption and Production", and one of the most important is Goal 17 "Partnerships to Achieve the Goals".

Community governance is a strategy to address integrated waste management, and Geoparks can help territories to comprehensively manage the waste generated by the local population and tourists. Local initiatives such as this are vital to create the community cohesion to confront such environmental problems. They may also provide the basis for bottom-up pressure on government and companies to change their waste policies and to clean up the world.

This work is contributing to and supported by the UNESCO International Geoscience Programme project 692 'Geoheritage for Resilience', and ECOS 'Building Sense in Natural Heritage'.

EXPLORING THE POTENTIAL OF GEOPARKS IN SAUDI ARABIA: UNVEILING NATURE'S MASTER PIECES

Hassan Etourki, *Saoudian Geoprks*

The address titled "Exploring the Potential of Geoparks in Saudi Arabia: Unveiling Nature's Masterpieces" aims to delve into the untapped potential of geoparks in Saudi Arabia. Geoparks have emerged as powerful tools for conservation, education, and sustainable tourism, offering unique opportunities to showcase the country's geological heritage. This address will embark on a comprehensive exploration of the geopark concept, highlighting the diverse landscapes, geological formations, and cultural significance that make Saudi Arabia an ideal candidate for geopark development.

Saudi Arabia is blessed with an abundance of natural wonders and geological treasures that have shaped its history and culture. From the vast deserts to the majestic mountains, the country's geological diversity is awe-inspiring. By establishing geoparks, Saudi Arabia can protect and preserve these natural masterpieces while promoting environmental conservation and sustainable land use practices.

Geoparks serve as educational platforms, providing visitors with a deep understanding of the Earth's history, geology, and the intricate relationship between humans and their geological surroundings. Through interpretive centers, guided tours, and interactive programs, geoparks offer immersive learning experiences that engage both locals and international visitors. By exploring Saudi Arabia's geological heritage, visitors can develop a profound appreciation for its natural wonders and cultural significance.

Furthermore, geoparks have the potential to drive sustainable tourism, attracting nature enthusiasts, geology aficionados, and cultural explorers from around the world. The unique geological formations and cultural treasures of Saudi Arabia have the power to captivate the imagination of these visitors, creating opportunities for economic growth, job creation, and community development. Local businesses can thrive through increased tourist activity, generating revenue and enhancing the overall socio-economic well-being of the region.

However, establishing geoparks in Saudi Arabia comes with challenges that need to be addressed. These challenges may include securing funding for infrastructure development, implementing effective management strategies, and ensuring the respectful engagement of local communities. By acknowledging and addressing these challenges, this address aims to foster dialogue and collaborative efforts among government agencies, academia, local communities, and relevant stakeholders to overcome obstacles and unlock the full potential of geopark initiatives.

To inspire and guide geopark development in Saudi Arabia, this address will draw insights from successful geopark models from around the world. By examining their best practices, lessons learned, and innovative approaches, Saudi Arabia can leverage its specific geological and cultural assets to create unique geopark experiences that resonate with visitors and foster sustainable development.

In conclusion, the address "Exploring the Potential of Geoparks in Saudi Arabia: Unveiling Nature's Masterpieces" seeks to unveil the untapped potential of geoparks in Saudi Arabia. By highlighting the diverse landscapes, geological formations, and cultural significance, it emphasizes the country's suitability for geopark development. Moreover, the address will discuss the benefits and challenges associated with establishing geoparks in the region, emphasizing their positive impact on local communities, environmental preservation, and economic growth.

Through the examination of successful geopark models and the consideration of Saudi Arabia's unique geological and cultural assets, this address aims to inspire collaboration and lay the groundwork for future geopark initiatives in the country, ensuring the protection and appreciation of nature's masterpieces for generations to come.

LATIN AMERICAN CARIBBEAN GEOPARKS NETWORK GEOLAC NETWORK: PROGRESS AND CHALLENGES

Eugenio Bidondo E, Patricia Herrera P, Juan Carlos Mora Ch, Mónica Bueno de F, José Boada V

The GEOLAC Network, since its creation in 2017, has placed emphasis on building and strengthening the network based on the UNESCO Geosciences and Geoparks Program, and the definitions of the Global Geoparks Network (GGN), with the objective to contribute to the Sustainable Development Goals (SDGs), pillars of the long-term strategic agenda.

Our challenges in recent years have focused on maintaining an active work schedule to advance participatory planning linked to the GGN Strategic Plan. In the Conference held in the month of November 2022 in the Imbabura Global Geopark, the formation of the working groups that can propose actions to respond to management challenges and promote their sustainability in the territories is approved, in which four working groups (Gender, Indigenous Peoples, Education and Geotourism) and two transversal groups, the group from the magazine Geoexperiences and the Communication and Dissemination group.

In the last Conference of the Geolac Network, the activation of the working groups was agreed (2023-2024 work agenda), through the realization of: Regional training workshops for Geoparks projects (Geolac Network–PIGG Montevideo UNESCO Office). Design an

America. Other networks and institutions. Strengthen a Communication Plan. Updating web information. Continuity in the publication of the Geoexperiences Magazine. Celebrate , as Red

GeoLAC ,International days such as the day of the Original Peoples, the day of Geodiversity, the day of risks and disasters and the day of Geotourism.

The Network will continue to strengthen the work based on the principles of the Geoparks "From the bottom up" with the active participation of those who lead processes in the territories, and likewise improve knowledge management.

EDUCATION WITH SIMPLIFICATION OF SCIENTIFIC KNOWLEDGE ACCESSIBLE TO THE GENERAL PUBLIC

Erika Lima de Melo Eugenio, Antony Thierry de Oliveira Salu, Allysson Pontes Pinheiro, Carlos Kleber Nascimento de Oliveira, Maria Edenilce Peixoto Batista, José Patrício Pereira Melo

Araripe UGGp – Museu de Paleontologia Plácido Cidade Nuves

The accessibility in museums and cultural environments in general is a right of all the deaf community. However, there is an inoperability picture of the most diverse methods regarding its implementation, process which acts like propellant of inaccessibility in these environments. As consequence, the number of museums that have accessible environments and experiences is negligible, even if your demand is growing. Such an approach is developed in the Paleontology Museum Plácido Cidade Nuvens context, located in the city of Santana do Cariri - CE, one of the equipment linked to the Geopark Araripe. Therefore, the present article discusses about the difficulties encountered by the deaf community in relation to cultural environments, like museums that little guarantees accessibility measures and, therewith, presents the intervention process of the afforested Museum, through creation of an accessibility nucleus made up of professionals and specialized collaborators who support the deaf community. Thus, the accessibility nucleus, through the use of Brazilian Language of Signals (LIBRAS) and others integration and inclusion measures, was responsible for promotes to the deaf community an integral and rich visitation experience, as well as for guaranteeing their rights to culture, to history and to brazilian memory, respecting individuality of its visitors and promoting an equal experience of environment. To professionals and collaborators enabled the enrichment of his professional and personal training. Concludes, hence that such intervention provided benefits both to the target audience and to implementing agents, providing opportunities of equal cultural experiences.

FOR SUSTAINABLE TRANSPORT INTEGRATION, AN E-VAN WILL BE PURCHASED AND A PILOT CASE WILL BE ESTABLISHED TO CONNECT TOURIST SPOTS IN THE CLASSICAL KARST AREA WITH PUBLIC TRANSPORT.

Edi Fabjan

Efforts to establish the geopark on the Classical Karst have been ongoing since 2015. At that time, the municipalities in Italy and Slovenia concluded an agreement on the establishment of a geopark in the area of the Classical Karst. Geographically is geopark situated in Slovenia and Italy.

Finally, within the framework of the Interreg VI-A Italy-Slovenia Programme, the Karst-Carso II project was approved, within which the establishment of the European Group for Territorial Cooperation – EGTC is provided. In close future EGTC will take care for the management of cross- border tourism as well as the financing and management of the Kras-CarsoGeopark.

One of the project activities is implementation of the procedure for the inclusion of the geopark in UNESCO's Global Network of Geoparks.

First we plan to prepare complete documentation and valorisation geological heritage sites on the territory of the future geopark and in next step we will prepare and submit letter of intent for inclusion of the cross-border geoparkKras-Carso in UNESCO's Global Network of Geoparks.

On the poster map of future geopark will be presented. Some pictures of geosites will be included.

Project Kras-Carso II description

The project Kras-Carso II started on 1.1.2023 and the duration of the project is 36 months.

Within the project, innovation will be demonstrated by the creation of integrated tourist products, which will be based on the exceptional natural, especially geological and cultural heritage of the Classical Karst.

Research and scientific institutions that are project partners are leaders in their respective fields of activity and have top experts at their disposal, who will prepare professional studies and analyses about which attractions can be used for tourism products and further development, and then sustainable products will be created with innovative methods of interpretation. Digitization techniques such as 3D digital modelling, virtual reality and interactive exhibitions will be used too. Also, the promotion of project activities will take place by using digital tools. One of the main common tourist products will be a common path that will connect the entire area in a circular path, which will be connected to at least five circular paths with a total length of at least 200 kilometers. The network of cross-border routes for cyclists and pedestrians will be uniformly marked and accessible to different target groups.

Along these routes, geosites and other natural and cultural attractions will be presented, which demonstrate the uniqueness of the Classical Karst from the point of view of gastronomy, geodiversity, architecture, water sources, the world-renowned skill of dry wall construction and UNESCO-recognized geosites.

For sustainable transport integration, an e-van will be purchased and a pilot case will be established to connect tourist spots in the Classical Karst area with public transport.

AN INTRODUCTION TO LEYE-FENGSHAN UNESCO GLOBAL GEOPARK

Fan Lin

Leye-Fengshan UNESCO Global Geopark is situated in Leye County and Fengshan County Guangxi Zhuang Autonomous Region, China which are 350km and 365km from Nanning City, 250km and 366km from Guiyang City, 89km and 140km from Baise City respectively by motorways. The Geopark consists of 2 communities and 59 villages covering an area of 1113 square kilometers and is famous for "the kingdom of tiankengs and the country of caves", featuring international significant geological heritages such as Dashiwei tiankeng cluster, Sanmenhai karst windows caves and very large cave chambers, huge natural bridges and P/T Profile etc. From subterranean rivers to cave chambers, from karst windows, to tiankengs dolines and valleys, the area vividly records the evolutionary sequence of karst landforms. It consists of six major categories of geosites, including landforms, strata, paleontological fossils, rocks, structures and water. The geopark is a unique high-quality multi-type karst geopark with magnificent karst landscape as the core tourism resource. Due to the natural barrier of the tiankengs' cliffs and the connections with caves and subterranean rivers creating special microclimate conditions, it has become a "refuge" for plants and animals providing good ecological environment of the preservation and reproduction of many relict species and rare species. The Geopark has also strong ethnic customs featuring many cultural heritages and intangible heritages such as Chuanlongyan cave stone carvings, the old battlefields of Red Army, the traditional buildings of Zhuang people, the marriage and ritual cultures of Zhuang, Han and Yao people, the copper drum culture, the local ballad culture etc., these giving visitors a wonderful and spectacular as well as educational experience.

INTRODUCTION TO LINXIA GEOPARK

Fan Zhang

Linxia Geopark is located in Linxia Hui Autonomous Prefecture, Gansu Province, China. It spans arid area of the Loess Plateau and the cold and wet, alpine area of the Qinghai-Tibet Plateau which covers an area of about 2,120 square kilometers. Linxia Geopark is represented by the Cretaceous dinosaur footprint and the late Cenozoic mammalian faunas , supplemented by the late Cenozoic strata, Danxia Landform in northern Linxia and the Yellow River Three Gorges. It integrates the minority culture with local characteristics. Linxia Geopark is a comprehensive Geopark which is combined with geology, ecology and culture.

POPULAR SCIENCE LECTURES AND BOOKS DONATION PUBLIC WELFARE ACTIVITIES PROMOTE THE BRAND OF UNESCO GLOBAL GEOPARKS- TAKING DANXIASHAN UGGP, CHINA AS AN EXAMPLE

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In November 2018, "*Danxiashan: Spectacular Nature in the World*" Science Popularization Lectures and Book Donation Public Welfare Activities were officially launched. The event adopted a multi-party cooperation approach, with the author, Mr. Su Dechen, responsible for compiling courseware and training lecturers, the Geoparker Nature Education Center responsible for recruiting volunteers and contacting the schools, the China Petroleum Industry Press providing popular science books for each lecture, and the Danxiashan Administrative Committee providing necessary financial support. On November 2, 2018, the first lecture was held at Hanchuan Experimental Primary School in Hubei Province. As of December 2022, the event had been held a total of 509 times in hundreds of schools, with a total of 2,327 books donated, 282 science popularization volunteers serving as lecturers, and 41,603 teachers and students attending the lectures. This has helped to widely promote the brand of UNESCO Global Geoparks to the public.

The event not only showcased the Earth science, aesthetic, ecological, and cultural values of the DanxiashanUGGp but also introduced the GGN and its mission, enabling the public to better understand the geopark brand. Subsequently, many Chinese UGGps and aspiring geoparks, such as Yandangshan, Zhangjiajie, Huangshan, Shennongjia, Taishan, Dunhuang, LeyeFengshan, HuanggangDabieshan, and Jiuhuashan, began to hold similar activities, conducting science popularization lectures and book donation events in schools of all sizes, museums, and communities across the country. This has created a favorable situation where geopark science popularization activities have moved beyond the geoparks and entered campuses and the minds of young people. The geopark brand has become the most well-known and socially active name among the UNESCO World Heritage Sites, and is favored by young people.

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**STRATEGIES FOR THE FORMAL EDUCATION OF KEY STAKEHOLDERS IN THE KÜTRALKURA WORLD
GEOPARK: GEOTOURISM AND GEOHERITAGE DIPLOMA FOR LOCAL GUIDES**

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One of the great challenges of the UNESCO Kütralkura World Geopark is advancing in the generation of formal education strategies for key stakeholders since the formation of expert human capital in Geotourism and Geoheritage is a priority on its agenda. In response to this, a Geotourism and Geoheritage Training Program were designed, which was executed through one of the Universities that make up the scientific committee, the Universidad Católica de Temuco (UCT). The design and execution was in charge of teachers from the four universities of the committee (Universidad Católica de Temuco, Universidad Austral de Chile, Universidad de Chile, Universidad Mayor Sede Temuco), in a consortium format, on which the UCT looked for strengthening this trans disciplinary and inter institutional working relationship. The Program was executed for 8 months, in which 25 people participated, coming from the whole Geopark territory. The selection criteria of the applicants aimed to have local operators and guides, plus local development agents of the territory, who had a territorial link with the Geopark. The classes were held between 2020 and 2021 remotely, due to the context of the COVID 19 health emergency. The Diploma in Geotourism and Geoheritage for key agents of the Kütralkura Geopark was the first of its kind in the country, also attending the need for professional training that arise within the people who live and/or work in tourism within the territory.

The strategies used during the course included collaborative learning, with tasks inside and outside the classroom for the identification and understanding of the natural and cultural heritage of the Kütralkura Geopark. We also used inverted classroom that allowed students a discussion and analysis around the main components of the current tourist praxis in the Kütralkura Geopark and learning by research, where students review and study various contents linked to the natural and social sciences of the area. During the execution of the Diploma program, we also had to mourn the death of one of the area coordinators and professor of several modules, Manuel Gedda, whom we include as the author of this abstract because he spends many hours in the training process and his contribution has been highly appreciated by all the students. The result of the first version has been highly valued, because a University Diploma certification was granted to young people who did not have access to continuing higher education.

CAN LOCAL COMMUNITIES SAFEGUARD THEIR GEOHERITAGE? THE CASE OF PALIGREMNOS, IN CRETE, GREECE

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The area of Paligremnos is located in the southern, central Crete, in Greece. It represents a large vertical fault scarp at the edge of Plakias bay, a coastal village in the Regional Unit of Rethimnon. On May 2022 more than 1500 people were gathered together in front of Paligremnos to protest against the intention of a land owner who started excavations over the fault scarp to build underground touristic apartments. These people were representing local inhabitants and businessmen, climbers, mountaineers, speleologists, foreign people who had their residency in the area, tourists who were coming in the area for many years, and representatives of local authorities and organisations. The mottos of the protest were: "We will become a rock to protect our rock" and "Development which destroys nature is not a development". This protest and collection of supporting signatures through the web (more than 15.000 collected) led the local Municipality to assign a Special Study to the Natural History Museum of Crete for the protection of the area, while in parallel, together with local associations and groups started a legal procedure to block the investment.

But why the local communities and foreigners stood up and demanded the protection of a fault scarp? The Paligremnos is an iconic geosite which was assessed by Fassoulas et al. (2007) as of a National Value, but without any legal protection status. It is part of a fault zone which runs along the peninsula of this area, which comprise of two more fault surfaces, one of them dipping into the sea. The main fault scarp of Paligremnos is being used as a climbing field with more than 14 different routes on its surface, which receives hundreds of climbers every year. As the Special Study revealed, the Paligremnos is largest, naturally exposed fault scarp in Greece, having a length of 132m. and a height of 42m. Well preserved polished surfaces contain kinematic indicators and slickensides of two generations, which point to a normal fault. Moreover, the fault zone appears to be an antithetic one to the main active fault zone of Sfakia-Sellia, that together form the Plakiasgraben. Other geological features that can be found in the broader area are five marine terraces in various heights, the raised notch by the 365 AD earthquake (about 8.3 Richter scale) at about 1,8m a.s.l., small cavities and tufa deposits on the fault scarps, as well as rock slidings from the higher fault scarps. The natural environment is also outstanding with sand dunes reaching almost the Paligremnos and several endemic species of Cretan flora living in the area. Remnants of past coal exploitation and fortifications from the WWII are also to be found nearby. The broader Paligremnos area was representing thus the only unspoiled natural area in the touristic zone of Plakias and was the landmark for the whole territory. The new investment was putting the monument under a great risk.

The Study that was conducted revealed the values and the need for the protection of the area, was accepted by all local and regional authorities and was submitted at the beginning of 2023 at the Ministry of Environment and Climate Change for the declaration of Paligremnos as "Protected landscape and protected natural monument". In May 2023 a Ministry Decision approved the Declaration, while earlier the local courts, cancelled the permission for the constructions in the area.

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SYNERGIES FOR SUSTAINABLE DEVELOPMENT BETWEEN UGGPS AND MABS IN THE ISLAND OF CRETE, GREECE

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The Region of Crete is of the top tourist destinations in Greece hosting a unique and wealthy natural and cultural environment that is present at the 53 Natura 2000 areas, that cover about 32% of the island's extent and the numerous cultural and historic monuments existing widespread all over the island. Among them of great value are four territories designated either as UGGps (Psiloritis and Sitia), or MABs (Samaria and Asteroussia). In 2017 the Region of Crete decided in collaboration with the managing authorities of the three UNESCO areas existing at that time (Samaria, Psiloritis and Sitia) decided to work further on the exploitation of the UNESCO designations and to develop a new tourism product focused on alternative and thematic tourism and the sustainable development of Crete. This product was titled "The UNESCO areas in Crete" visioning the use of UNESCO's brand name in order to establish an alternative to massive tourism proposal for the tourism development of the island in terms of sustainability and focusing on its inland. This development should be based on Responsible tourism principles, Smart Specialisation and the cultural and environmental features of the island and it was expected to enforce local economy contributing in the extension of tourism season, the enhancement of tourism competitiveness, the increase of the efficiency of resources, and the improvement of residences' quality of life.

The initiative was supported by an Integrated Spatial Investment fund aiming to capitalize the outcomes from the implementation of Eu and National development programs. The Investment attributed all these years more than 11M Euros, in projects that were proposed by the municipalities of the three designations and their management organizations, on the topics of natural and cultural heritage protection and promotions, development of principal and necessary infrastructures, development of an Action Plan and a Branding Strategy. During the 6 years of the implementation of this Integrated Spatial Investments, several projects were funded, the Action Plan was fully implemented, while the Branding Strategy, initiated in 2022 with the inclusion of the newly designated Asteroussia MAB. This Branding strategy is still in action, having developed, with the support of National Geographic a successful promotional campaign in international magazines, exhibitions and thematic tourism meetings/. In addition, a network of thematic routes is being developed to connect not only the various characters and heritage of these areas but also the areas themselves in a unique tourism experience, the "UNESCO Sites in Crete". Info and Interpretations panels have designed and emplaced at the various areas, whereas a new webpage

[\(https://www.unescositesincrete.gr/\)](https://www.unescositesincrete.gr/)

concentrates and promote all the outcomes, and is being used a tool for the potential visitor to learn the values of and design its journey to the UNESCO designations of Crete. This Integrated Spatial Investment was highlighted EU as one of the most important in European level.

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GEPARKPROJECT IN LIBYA; FEATURES AND CHARACTERISTICS

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We aim through this work to present the scientific summary to introduce Geoparks and ways to preserve and manage the geological heritage in the State of Libya according to accurate scientific standards. Meanwhile, regard to the Arab countries, there is only one geological park, which is in the State of Morocco. Through the scientific and practical discussion, we had a proposal to clarify the areas of geological importance in Libya, and the most important of Geopark Area is Akakus Mountains, SW Libya. During the field studies, this site was of great importance to participating in the symposium as great location of the Geoparks project, mandated previously by UNESCO, explained the basic conditions that are supposed to be met for obtaining global approval for Geoparks. During current time, it will be agreed to prepare a brief booklet containing information for a single geological heritage site of all the features and characteristics in the Akakus Mountains.

What do you know about the Akakus Mountains or Tadrart Akakus, SW Libya?

The Akakus Mountains located in the SW Libya in what was known as Fezzan, within the great Libyan desert, the nearest city to it is the ancient Ghat. Akakus has a variety of landscapes, from sandy winds colored to rock arches and huge stones to valleys. Among the most important sites in the region are the "Avazagar" Arch and the "Ten Khelja" Arch. Although the region is one of the most arid regions in the Sahara, there are some plants such as the "Kalotropis" Plant. The region is famous for its ancient caves, and it is rich in a collection of carvings and paintings drawn on the rocks. It was declared by UNESCO as a World Heritage site in 1985 because of the importance of these paintings and sculptures. Some of them date back 21,000 years.

Which reflects the culture and nature of changes in the region?

The paintings and sculptures are of animals such as giraffes, elephants, ostriches, and camels, as well as a group of people, pictures of men depicting different aspects of the life of the ancient man. Akakus in Greek mythology was the king of Acassium in Arcadia, son of Lacon and the breastfed father of Hermes.

**COMMUNICATION AND EXTENSION IN THE QUARTACOLÔNIA UNESCO GLOBAL GEOPARK:
POPULARIZATION OF SCIENCE AND PROMOTION OF CITIZENSHIP IN THE TERRITORY**

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The territories recognized as UNESCO Global Geoparks are unique places in the world, in which memory, the present and future development are articulated in the forms of coexistence between humanity and the environment. Especially in the Quarta Colônia UNESCO Global Geopark, the scientific potential of the territory stands out, housing the oldest dinosaur fossils in the world and the natural landscapes of a forest that is witness to the environmental changes of the planet in the last 250 million years. In this context, the popularization of this historical and natural knowledge for the local population becomes a challenge, given the need not to erase local knowledge in favor of scientism discourse or mischaracterize the discoveries recorded in the region. The articulation between University Extension and Communication, in the Brazilian context, is a fundamental strategy for the consolidation of the ideals of Geoparks in the populations of these unique places in the world. In addition to the popularization of science, the works developed in this process of connection between university and society also allow a considerable advance in citizenship issues, enhancing craft works that, by valuing the cultural and natural heritage of Geoparks, contribute to sustainable development. This paper highlights the actions developed by the Progredir Geoparque Quarta Colônia project. It is an initiative articulated between the Brazilian federal government, the Federal University of Santa Maria and the municipalities that make up the Geopark territory to train low-income residents to promote job and income generation based on the characteristics and potential of this unique space in the world. In all the cities that make up the Geopark, medium-term courses are offered to people in situations of social vulnerability, so that they acquire theoretical and practical knowledge in the development of handicrafts. The project also has childcare for mothers who participate in the training and food for the course participants. All the courses carried out are aimed at promoting the territory, valuing culture and preserving the environment. Articulating scientific communication and the recording of local stories with the extension actions developed by the academic community, the communication practices employed constitute powers for the realization of the principles of UNESCO Global Geopark.

GEPARK AND CULTURAL HERITAGE: A PROPOSAL FOR A DIGITAL INTERPRETIVE CENTER FOR THE QUARTA COLÔNIA AND CAÇAPAVA UNESCO GLOBALGEPARKS

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This work aims to contribute to the construction of content for the implementation of a future "Digital Interpretive Center of Cultural Heritage", an online environment that presents the main heritage aspects of the Quarta Colônia and Caçapava UNESCO Global Geoparks, promoting cultural experiences and the appreciation of the various identity expressions that circumscribe those places. We seek, through communicational processes, to stimulate relations with the creation of territorial bonds between the individuals of those communities based on their heritage assets. It is important to emphasize that the role of communication in the context of heritage preservation, in addition to generating associations and fostering a sense of belonging, should be to socialize knowledge. The UNESCO Global Geoparks are territories that, in terms of culture, allow the appreciation of traditions, memory, as well as the establishment of links with the place where the community is inserted. At this point in the research, materials already produced by previous projects are being gathered and selected to compose the digital showcase: documentary and promotional videos of the territories (Fig. 1 A, E); drone-obtained 3D models of natural and cultural assets (B); interactive virtual tours of the historical heritage (C); soundscapes of diverse natural environments and cultural activities (D); dynamic 3D animations of geological and geomorphic processes; digital interpretive centers of municipalities and partners (F). The work carried out so far allows us to infer that associating communication with cultural heritage knowledge, including the cultural value of natural heritage, can contribute to geoparks, through strategies for disseminating information, strengthening ties and cultural recognition of the population and of visitors with the territory.

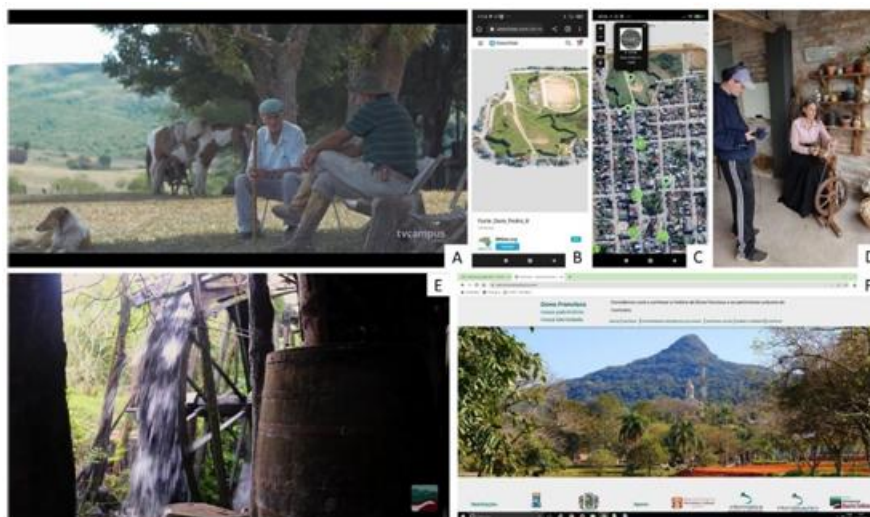


Figure 1:

- (A) Documentary film "Unravelling the giant," on the findings of ground sloths in Caçapava UGGp;
- (B) Cellphone print screen of a 3D digital model of a fortress in Caçapava UGGp;
- (C) Cellphone print screen of a digital interactive map of Caçapava UGGp historical district;
- (D) Spinwheel soundscape recording;
- (E) Quarta Colônia UGGp promotional video;
- (F) Dona Francisca Digital Interpretive Center, a model for the proposed environment.

**UNESCO GLOBAL GEOPARKS (UGGP) – CONNECTION BETWEEN DIFFERENT ENTITIES INSIDE TERRITORY
(PERSPECTIVE OF IBERIAN PENINSULA TERRITORY MANAGERS)**

Jorge Ferreira - CEGOT – Universidade de Coimbra

The Geoparks were initially established to enable the conservation of geological sites in economically vulnerable regions by promoting sustainable tourism (Zouros, 2004). The territory should be managed by an entity with a participatory and inclusive approach to the different actors within the geopark territory. The development of these territories is done with the support of tourism (geotourism). Tourism activity must meet the criteria defined by UNESCO while keeping the territory attractive with endogenous activities.

The Iberian Peninsula has twenty geoparks integrating the UGGp, and this network is quite heterogeneous regarding distribution and differentiating factors. The total area occupied by the geoparks of the Iberian Peninsula is approximately 48,000 Km². Portugal has five geoparks and Spain fifteen that are part of this network.

A survey, with managers of the geoparks of the Iberian Peninsula integrating UNESCO Geoparks network, tries to understand the degree of involvement of partner and non-partner entities within these territories. Fifteen responses were obtained concerning twelve different geoparks (three Portuguese and nine Spanish), representing approximately 26,355 Km². Representatives of the management and scientific coordination areas answered the questionnaires.

Geotourism presents a comprehensive approach involving geoconservation, outdoor activities and cultural and immaterial heritage. The territories analysed present characteristics that reconcile all these points that can be transformed into tourism products. The landscapes are the driving force behind the visit to the territory. Tourists also look for activities, whether they are unique or together. The managers should therefore take advantage of this potential and, together with the different entities, develop solutions to meet the demand of the geotourist.

The geopark manager's perception is that partner entities have a greater involvement and a more significant presence in the geopark's support structures. Greater participation by the partners leads to a greater awareness of sustainability issues while they contribute more actively to the promotion of the territory.

There is some ignorance on the part of the territory managers of most of the actual activity of the non-partner entities. However, this lack of knowledge is not reflected in the participation of the non-partner entities in activities, translating into the diversification of products that the geopark makes available. A strategy of integrating the current non-partners can be created, bringing added value for the territory and its preservation and for the operator itself because it will ensure the destination's sustainability.

A significant limitation of the study is the low response rate. It influences the data treatment, namely the correlation analysis between different factors. Also, the non-identification of the number of agents operating in each area (infrastructures and activities) limits the study to the extent that it is impossible to understand the weight of each one in the geopark.

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Zouros, N. (2004). The European Geoparks Network – Geological heritage protection and local development. *Journal of International Geoscience*, 27(3), 165-171.
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DINO PARQUELOURINHÃ (PORTUGAL) – A DINOSAUR PARK AS AN EXAMPLE OF PARTNERSHIP AND ADAPTATION TO THE FUNDAMENTAL REQUIREMENTS OF AN ASPIRING GEOPARK

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The Dino Parque da Lourinhã is a partner of Oeste aspiring UNESCO Global Geopark (OaUGGp). Its integration led to the need for adaptation to comply with all the requirements demanded by UNESCO's statutes. The Dino Parque da Lourinhã opened in 2018 in Lourinhã to disseminate and promote paleontological heritage. It is organized into three main areas - a park with full-scale models, a museum with a visible laboratory, and a site for the public to carry out activities performed by paleontologists.

From its creation, it is considered one of the largest open-air museums in Europe dedicated to dinosaurs and the evolution of life on Earth; being set in an area of 10 hectares, with five thematic routes from the Paleozoic to the Cenozoic (Devonian to Holocene), and a site dedicated to marine life, with 200 models on display. Since it opened, it has received over 1.075.000 visitors, of which 180.000 come from schools.

The museum component results from a partnership with the local museum, GEAL - Museu da Lourinhã, where some of the most significant fossils of Lourinhã are exhibited. This partnership also extends to the scientific research part, in which some of the fossils are prepared in the laboratory of Dino Parque da Lourinhã. Still within the scope of this partnership and together with other companies of the Dinopark Group, the first full-scale 3D model of one of the local dinosaurs, *Miragaia longicollum*, was created. This specimen was found in diverse outcrops of the region that integrates the OaUGGp.

Since the beginning, the Dino Park of Lourinhã has sought to find partners at a local level. Thus, many of the products that are used internally are from local suppliers, thus encouraging the local economy. Some products that initially came from outside the country are now produced locally. Also, 90% of the human resources are people who live in the region.

Dino Parque da Lourinhã also has a commercial aspect where previously it was possible to carry out some activities, which included Wyoming fossils, geodes and pyrites. With the integration of Dino Parque da Lourinhã as a partner of OaUGGp, a transformation began in that business area where there was the need to redefine these activities in order to create new activities and products without the use of any geological samples.

In this context and despite the financial impact, the board of Dino Parque da Lourinhã took the decision not to sell fossils or any geological material. The geological materials left over from commercial activities are now used to support educational and laboratory activities without being commercialized.

The partnership established with the OaUGGp also led to the educational training of the Dino Parque da Lourinhã team. Today they have a more accurate knowledge of the Geopark concept and are more focused on the territory's characteristics. The Dino Parque da Lourinhã team already has five elements that are certified Geoguides of the OaUGGp, supporting the promotion and dissemination of the territory.

With all these initiatives, the board of Dino Parque Lourinhã decided to take on an active and fruitful cooperation with OaUGGp, contributing to the safeguarding of geoheritage.

IJENUGGP: PROMOTIONAL STRATEGY FOR THE THREE PILLARS OF GEOPARK TO ECONOMICAL IMPROVEMENT OF BANYUWANGI REGENCY

Ipuk Fiestiandani - *Regent of Banyuwangi, East Java Province, Indonesia*

Three main pillars of geopark, namely geology, biology, and cultural, are important components for the sustainable development of Banyuwangi Regency as part of the Ijen Geopark UGGp. The amazing natural beauty - Mount Ijen with its blue fire phenomenon or Alas Purwo Forest, which is one of the UNESCO Man and Biosphere Reserves - is developed through the concept of ecotourism. This is further supported by various sport events held in Banyuwangi such as Geopark Run, Tour de Banyuwangi Ijen, and Quicksilver/ROXY Pro-G-Land World Surf League (WSL). The original cultural heritage of the Osing Tribe, an indigenous Banyuwangi tribe, is maintained through traditional dances that are displayed during various events in Banyuwangi. Strategic infrastructure such as the airport is also built with an environmental-friendly concept in the form of a Green Airport. In addition, public facilities and hotels are required to accommodate the use of traditional ornaments and local architectural designs.

Economic empowerment of local communities is also considered. For example, the development of below-3-star-rating hotels is forbidden, and the establishment of modern retail is prohibited, giving ways for community-owned homestays and small shops to develop, which are further supported by the so-called Hotel Asuh Homestay (Hotel Care Homestay) Program for their hospitality improvement. These various efforts are bringing positive impacts for Banyuwangi, namely the per capita income continues to rise and the poverty level to decrease. Banyuwangi is committed to continue these three pillars because it believes that they can help create a decent home for future generations.

NEW GEOCONSERVATION AND GEOTOURISM MEASURES AT A WELL-KNOWN DINOSAUR TRACKSITE IN THE TERRA.VITA UNESCO GLOBAL GEOPARK

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The Dinosaur Tracksite Bad Essen-Barkhausen is not only one of the oldest geotouristic highlights but also one of the most visited geosites in the UNESCO Global Geopark TERRA.vita. The Geopark has recently implemented new geoconservation and geotouristic measures to protect the geosite for future generations and to keep the public interested in the Jurassic Earth's history of the area. The Geoconservation measures were accompanied by a palaeontological revision of the tracksite, leading to new insights on the Late Jurassic palaeobiogeography in Central Europe.

Located in an abandoned quarry at the top of the Wiehen Hills (NW Germany), ca. 153 million year old sub-circular footprints of sauropods and tridactyl imprints of theropods are exposed in a sub-vertical position of a quarry rock wall. More than 130 single footprints can be assigned to nine trackways of narrow-gauge sauropods of small size and to three trackways of large theropods.

Since the discovery of the tracks in 1921, their preservation has been challenging. Due to the dense joint set in the host rocks, it has not been possible to recover the tracks. As a result, an in-situ fossil geosite has been established that requires ongoing conservation. In the 20th century, applied conservation methods included cast preservation, impregnations, joint sealing, cement slurry injections, and the installation of concrete rain gutters. In 2000, the Geopark installed a glass roof construction over the surface with the dinosaur tracks.

In 2021 and 2022, new in-situ preservation measures were put into place and started with the removal of the vegetation cover and the cleaning of the track layers. At the top of the quarry, the disintegrated rocks were cemented, and the outcrop edge stabilized with concrete bars. Furthermore, two new concrete drainage systems were set up, and the existing drainage bar has been restored. A lime-based joint mortar was used to seal joints and gaps between track layers.

The recently implemented geoconservation measures revealed not only undescribed footprints but also paved the way for a palaeontological revision of the site, as published by Meyer et al. (2021) in the scientific journal *PalZ (Paläontologische Zeitschrift)*, volume 95(3). Meyer et al. conducted large-scale photogrammetric measurements for the first time. Based on the measurements, they taxonomically revised the footprints and gained new insights into the Late Jurassic palaeobiogeography in Central Europe (Meyer et al. 2021).

The Dinosaur Tracksite Bad Essen-Barkhausen has been a geotouristic highlight since the dinosaur trackways have been discovered. Already in 1921, a nature guide leaflet was created to lead hikers to the highlight. Today, the geosite is developed as an open-air museum. Two recently renovated life-size dinosaur models give visitors an imagination of the track producers, accompanied by information panels. New shelters and benches invite hikers on the newly implemented TERRA.track *Megalosaurus* to rest at the tracksite. The tree stumps that died because of a draught were used for an art project of wood carving; a special dinosaur rally for children introduced in 2021 gives information on the evolution and biology of dinosaurs.

The Dinosaur Tracksite Bad Essen-Barkhausen is a good example of the generation of financial and public interest to implement costly geoconservation measures by the recurrent renewal and expansion of geotouristic infrastructure and the implementation of new scientific studies.

ATTRACTING VISITORS ON GEO-EDUCATION DURING THE SARS-COV-19 PANDEMIC (MARCH 2020 - MARCH 2023) BY GAMIFICATION ACTIVITIES ACROSS THE WEB PAGE OF MESSEL PIT WORLD HERITAGE SITE, GERMANY.

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The transfer of geoscientific themes is since the 1980s of the 20th century an important part of geoscience popularization activities that has led to geotrails, as well as of the European and Global Geoparks Network. For UNESCO World Heritage Sites, education is since 2012 defined as an official task. Parallel to guided tour offers for visitors into the Messel Pit World Heritage Site, new steps were done from 2004 up to today. Especially with the appearance of the Sars-CoV-19 pandemic, themes of this unique site were transmitted to interested web page visitors - www.grube-messel.de - by game activities, e.g., quiz and question games, video sequences, to paint paper sheets, and on portraits of fossils of the extraordinary well-preserved fossils. The topics show a variety, especially to attract a wide audience within the population. Across regular, monthly documentation of the web page visitors' data have been collected from March 2020 up to March 2023 on the mentioned activities.

This contribution presents results on the numbers of counted visitors who visited the activities from March 2020 up to the end of March 2023. It can be seen that over the three-year period, the different activities in different months around the year are used by the visitors. A clear increase in web page visitors is documented, especially during the pandemic when museums and the visitor center at the Messel Pit WHS were closed, and people were not allowed to meet other people. It is a surprising result that after the reopening of the visitor center at the UNESCO World Heritage and the start of guided tours again into the UNESCO World Heritage Site Messel Pit, the numbers of visitors using the webpage increase further on. Special attention shall be given to the fact that the presentation of the fossil portraits of the Messel Pit WHS achieves the highest counting of all activities in total.

In the context of the activity diversity on the web page, it can be seen clearly that children-oriented activities are chosen as well as popularly explained geoscientific topics on the extraordinary fossils of the WHS Messel Pit. Video-walks have not achieved this popularity and show less counting in comparison to analog activity proposals. The results show that the set target: reaching a wide audience within the population is being reached and those games find very high interest and are highly liked by visitors like the popularly explained and presented fossils. For the geoscientific theme transfer or geoscience popularization, it can be concluded that visitors show interest in activities and themes which make them curious on topics, which bring excitement for a certain time span, and which open a new view or "world" to visitors and humans in an understandable and attractive way.

HARMONY OF GEOLOGICAL AND CULTURAL HERITAGE: THE CASE OF NANKI KUMANO GEOPARK, JAPAN

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Geoparks and World Heritage sites have a significant and mutually beneficial relationship, creating a synergistic effect when combined. The Nanki Kumano Geopark, in particular, has deep connections between its geological features and the beliefs and cultural landscapes of its people.

In our area, there is Japan's highest waterfall, located at the boundary between sedimentary and igneous rocks, shaping a landform through differential erosion rates. This waterfall is worshipped as a "deity" and also revered as "Kannon" (bodhisattva in Buddhism). In the surrounding area, Shinto shrines and Buddhist temples are adjacent, and visitors have a custom of offering prayers to both gods and Buddhas. An annual fire festival at the waterfall includes dance performances for a bountiful harvest. These sacred sites and pilgrimage routes form the UNESCO World Cultural Heritage site "Sacred Sites and Pilgrimage Routes in the Kii Mountain Range."

The overlap between Geopark and World Cultural Heritage site are limited to approximately 1.7% of the area. However, even in non-overlapping regions, similar beliefs and rituals centered around "rocks" are prevalent. Additionally, The pilgrimage routes also served as pathways for daily life in the past, skillfully utilizing the natural terrain for their construction. For our region, the Geopark not only covers the designated World Heritage areas but also extends to encompass the entire area where we live. By using the Geopark to connect various legacies deeply rooted in our region's history, we can enhance the attractiveness of the area.

Enhancing the region's appeal addresses local challenges. Day-trippers increased, but overnight visitors decreased. By leveraging the Geopark, we connect the landscapes, other heritage sites and the local way of life, providing comprehensive added value. This boosts overnight stays and economic benefits.

We actively promote the connection between the World Heritage site and the Geopark through guide training, geotourism, and educational programs. Seminars on cultural heritage and the Geopark target World Heritage Masters (136 individuals). This initiative disseminates information about the Geopark from the World Heritage side.

The Nanki Kumano Geopark harmoniously coexists with geological and cultural heritage. We believe our initiatives set a valuable example and contribute to the UGGp network.

AN APPROACH TO THE GEOMORPHOLOGY OF THE LANDSCAPE UNITS IN THE SIERRAS SUBBÉTICASGEOPARK (SPAIN)

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The Sierras Subbéticas Geopark belongs to the European and Global Geopark Network since 2006, while it was declared as UNESCO Global Geopark in 2015. The landscape and geology of the Geopark are closely related; ridges are formed of hard limestone; valleys are created in areas underlain by softer argillaceous carbonates and other detrital sediments. The rocks, which range in age from the Jurassic to the Tertiary, were deposited approximately between 200 million years and 25 million years ago. The rocks are rich in fossils and are noted for their Mesozoic ammonites. The Geopark is internationally recognised as one of the most significant areas for the study of the evolution of this group of fossils. However, the geopark landscape is also featured by remarkable landforms, most of them related mainly to karst processes, but also to fluvial, hillslopes, and periglacial ones.

This study deals with the featuring of landscapes from the geomorphological values point of view in the study area. To do this, the following methodological steps were carried out: i) inventory and mapping of landscape units based on physical variables (topography, geology, and climate) plus biological and human activity (vegetation cover and land uses); ii) geomorphological mapping and inventory of main landforms and processes featuring the landscape units. All these procedures were performed using open access geodata and orthophotos from PNOA (Aerial Orthophoto National Plan, National Geographic Institute of Spain), implemented in a GIS (ArcGIS 10.8.2), and verified by field campaigns and Google Earth Pro.

The results indicated that: i) the Sierras SubbéticasGeopark is divided into 4-landscape units at regional approach (E=1:100.000), while each is further subdivided into others at one more detail scale (E=1:25.000); ii) each of the landscape unit is clearly dominated by the presence of certain landforms related to either to current geomorphic processes (mainly, fluvial and hillslope/gravity processes) or to inherited ones (karst and periglacial processes). Also, the influence of structural geomorphologic features the landscape, especially in those landscape units including calcareous rock outcrops.

In conclusion, the methodology and the results achieved contribute to the scientific knowledge of the geopark and expand the dissemination of its geomorphological values among the local population and visitors. It is also a useful tool to improve its management.

Key words: Landscape, Geomorphology, Landforms, Geopark, Subbéticas.

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GEOTUR PROJECT “VALIDATION AND RECOGNITION OF TWO UNITS OF COMPETENCE IN GEOLOGICAL TOURISM”

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Geotourism is experiencing a strong momentum at the global level, promoted by policies of conservation and sustainable use of geodiversity and by the UNESCO Global Network of Geoparks. The consolidation of geotourism in Europe requires the training of highly qualified specialists that guarantees the valorisation of geodiversity for nature tourism, as a source of income and job creation, while ensures the proper conservation and management of the geological heritage, mainly in European Geoparks and rural areas with Sites of Geological Interest.

The establishment of a high-qualified vocational training system has been the aim of the GEOTURISM Project, which has been presented through the EU ERASMUS+ programme.

Two new units of competence have been developed at the European level like professional qualification.

- Competence Unit 1: Provide accompaniment and assistance services to tourists and visitors and design geotourism itineraries through the Sites of Geological Interest.
- Competence Unit 2: Interpreting the geological heritage and its values to tourists and visitors of European Geoparks.

The results of the project have been translated into a VET curriculum, through the RVA (recognition, accreditation and validation) process of the curriculum. It is available a website of the project to check the whole information of the project.

In terms of the impact of the project, it has achieved 900 direct beneficiaries and 7200 indirect beneficiaries as a result of the intellectual products and multiplier events (seminars for the dissemination of such products), 3600 via the website.

Partners of the Project

- Subbética Cordobesa Local Action Group (Spain)
- Sierras Subbéticas UNESCO Global Geopark (Spain)
- Ensemble for Sustainable Development and Promotion of Rural Employment -ADESPER - (Spain)
- Training and Development -FOR.ES- (Italy)
- University of Bucarest (Rumania)
- Novohrad-Nograd UNESCO Global Geopark (Hungary-Slovakia)

Key words: Geopark, geotourism, geodiversity, geological heritage, Sites of Geological Interest

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GEPARKS AND IMPLEMENTATION OF SUSTAINABLE DEVELOPMENT GOALS IBERIAN GEPARKS: A GENDER ANALYSIS OF LEADERSHIP

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UNESCO Global Geoparks (UGGps) are single, unified geographical areas where sites and landscapes of international geological significance are managed with a holistic concept of protection, education and sustainable development (UNESCO, 2023a). Therefore UGGps play an important role in promoting the Sustainable Development Goals (SDGs) defined by the 2030 Agenda. This paper analyzes how UGGps in Iberia are contributing to SDG 5, i.e., to achieve gender equality and empower all women and girls by ensuring women's full and effective participation and equal leadership opportunities at all levels of decision-making in the political, economic, and public life sectors. For this, and based on information available on UNESCO's website, we analyzed the composition of the official representatives by gender of the 20 UGGps of the Iberian Peninsula, 5 Portuguese UGGps and 15 Spanish UGGps (UNESCO, 2023b). The results show a gender imbalance in the composition of the official representatives of the Iberian UGGps (37 people in total), where 32% (12) are women and 68% (25) are men. Female representation is only 20% in Portuguese UGGps, and 37% in Spanish UGGps. Only in 2 Portuguese UGGps and 4 Spanish UGGps is there gender equality. In 4 Spanish UGGps there is a female predominance in the official representation (Fig. 1). Gender equality in the leadership of Iberian Geoparks is still far from being achieved, so the UNESCO Global Geoparks Council should create mechanisms to promote gender diversity in the composition of the official representatives of the UGGps, thus committing to the goals set for SDG 5 (UNESCO, 2017).

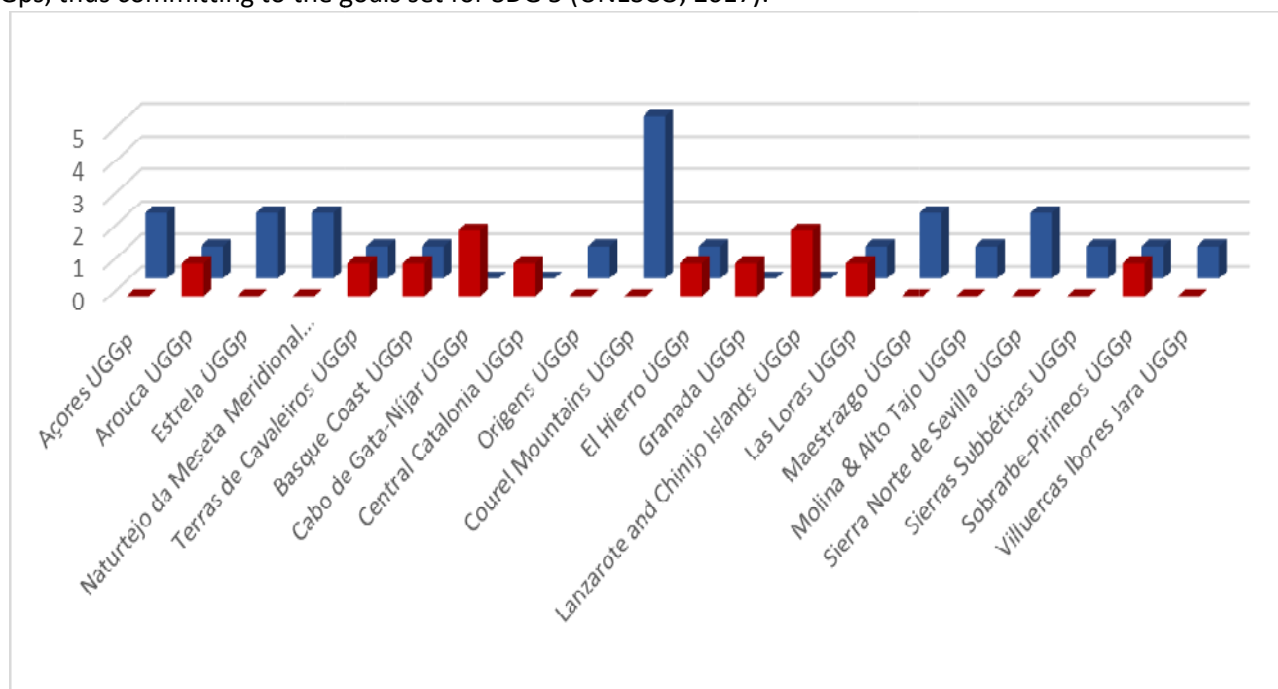


Figure 1 .Gender representation of official representatives of Iberian UGGps.

Keywords: Sustainable Development Goals, Gender Equality, Geoparks, Iberia

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**GEOCACHING AS A GEOTOURISM TOOL TO PROMOTE ANÇÃ VILLAGE
(ATLANTICGEOPARK PROJECT, PORTUGAL)**

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The village of Ançã, located in the District of Coimbra (Central Portugal), has a recognized Natural and Cultural Heritage (Cortesão, 1998; GAAC, 1990), with emphasis on the Stone, the Fountain and the Ançã Cake. This territory integrates the area of the Atlantic Geopark Project and there outcrop carbonate rocks of the Middle Jurassic with singular mineralogical and petrophysical characteristics, which make it especially appropriate for carving. This with the smooth limestone of the Ançã Formation (Bajocian-Bathonian) has been used for such purposes since prehistoric times, being particularly relevant its use in Renaissance sacred art, today displayed in several places in Portugal and abroad. The University of Coimbra – Alta and Sofia have been granted UNESCO World Heritage status in 2013, and all associated buildings, monuments and pedestrian streets are constructed from Ançã limestone.

The Ançã limestone was recently proposed to integrate the list of Global Heritage Stone Resource (Freire-Lista et al., 2023) and was the starting point for the design of a geo-itinerary based on the method of geocaching (Geocaching, 2023) with seven geocaches that aim to promote the natural and cultural heritage of the village: Geological Heritage: Ançã Limestone (#1) and Ammonite Fossils (#4); Cultural Heritage: Feast of Saint Thomas (#2), applications of Ançã Stone (#5), namely at the Ançã Fountain (#7), and the character Jaime Cortesão, an eminent intellectual from Ançã (#6); and Gastronomic Heritage: Ançã Cake (#3).

The aim of this work is to evaluate the receptivity of geocachers to the proposed itinerary, based on a holistic conception of culture, with a view to creating similar geo-itineraries throughout the territory of the Atlantic Geopark Project.

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EARTHCACHES IN THE TERRITORY OF THE ATLANTIC GEOPARK PROJECT (PORTUGAL)

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AD ELO - Associação de Desenvolvimento Local da Bairrada e Mondego, together with the municipalities of Cantanhede, Figueira da Foz, Mealhada, Mira, Montemor-o-Velho and Penacova, agreed on the goal of establishing the Atlantic Geopark in the area corresponding to those municipalities, aiming its integration into the network of UNESCO Global Geoparks (AD ELO, 2023).

Geocaching is used as a tool for the promotion and valuation of a territory, being EarthCache a type of Cache particularly suited for the promotion of the geology of a region (Geocaching, 2023). This paper looks at how the geology of the Atlantic Geopark Project (AGP) is being promoted through the EarthCaches placed in the territory. The data used in this study were collected from the Geocaching.com website on May 9, 2023. At that time there were 28 EarthCaches in the AGP territory, the first of which dated from 2007 (Penacova), and a total record of 9,251 visits. Regarding the distribution of EarthCaches and number of visits per municipality, Figueira da Foz reaches the highest values (21 and 7463, respectively), while Mira has no EarthCache in its territory (Fig. 1).

In this sense, the asymmetry detected in the territory of the AGP regarding EarthCache representation per municipality does not match the representation of the corresponding geological heritage already inventoried. This reality must be taken into account when designing and implementing future valuation strategies needed to boost geotourism in the territory.

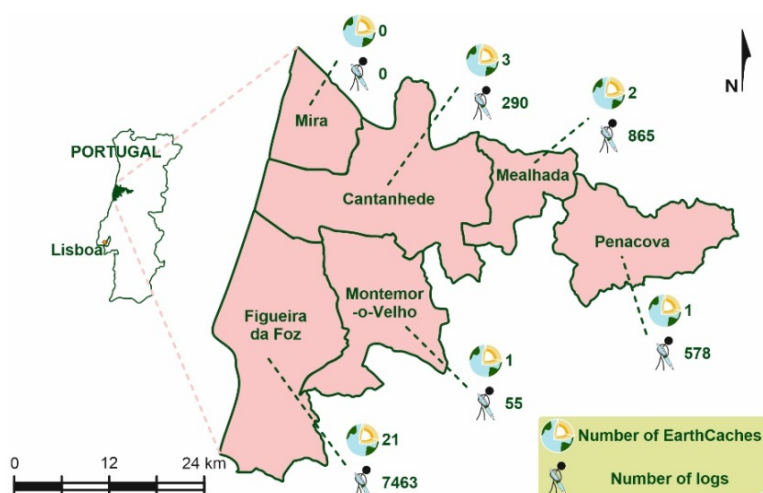


Figure 1 - Distribution of Earth Caches and number of visits per municipality in the territory of the Atlantic Geopark Project.

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Keywords: EarthCache, Atlantic Geopark Project, Portugal, Geological Heritage, Valuation

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BARRANDIAN NATIONAL GEOPARK - A JOURNEY ALONG THE BOTTOM OF THE LOST SEAS

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The largest national geopark in the Czech Republic (4 316,3km²) is situated in three regions – Prague, Pilsen and Central Bohemian. It is built of Proterozoic and Palaeozoic bedrock. The area is particularly rich in paleontological heritage. All epochs of the Palaeozoic can be found in the Geopark geosites, which gives the area real heterogeneity in possibility to present Earth evolution, especially fauna and flora connected to different eras. Only one other place covering that many epochs exists and it is in China. In the 19th century, extensive research in the Barrandian area was conducted by Joachim Barrande who described over 100 000 fossil finds of more than 3500 species. The geopark is also named after him. During the same century, the fossil plants associated with coal measures were also described in the western part of geopark by the founder of scientific palaeobotany Count Kaspar Maria von Sternberg. Geopark is involved in many activities, but its main mission are popularization and interpretation of fossil's findings and creation of fossils' models which are used within the project of Geopark schools (Geoschools) and also during the geological excursions. Within the project of Geoschools, there is a geopark lecturer going to school and taking over a lesson where he/she uses models and educates children about geology, palaeontology and about how geology influences surrounding environment. Geological excursions are led by the geopark guide who presents information about geology, palaeontology, and nature and if any participants find any fossils during the excursion, the guide also gives out educational cards about fossils to correctly remember the species what they found. Geomorphology of the geopark is characterized by high cliffs of the Berounka river valley and isolated rocks, small waterfalls, and caves, which give a special flair to the place. The Geopark area is valuable for its easy accessibility (to some of the sites you can even get by tram), well preserved nature and historic monuments as well as cultural intangible heritage. Hiking and biking trails in these areas is very popular and relaxing. The geopark management consists of management body and scientific committee.

TOPIC: STRENGTHENING GEOSCIENCE RESEARCH AND POPULARIZATION, BOOSTING GEOPARK SUSTAINABLE DEVELOPMENT BY GEO-VILLAGE CONSTRUCTION

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Fangshan UNESCO Global Geopark of China, the first Global Geopark located in the capital city of a nation, and birthplace of Geopark Concept, has achieved great progress in terms of geo-heritage protection, geo-science research and popularization, and region sustainable development by geo-tourism.

The work of geo-science research and popularization was comparatively weak point of the Geopark in the past. In accordance with the GGN Guidelines and recommendation raised by GGN experts, we have carried out a wide variety of geo-science popularization materials and activities, developing multi-functional popularization site, information system, perfecting geo-science explanation panels, and establishing geo-village boosting visibility and reputation of the Geopark.

Key words :Geopark, Geoscience popularization, Geo-village, Sustainable development

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THE ROLE OF ECOSYSTEM SERVICES IN THE ASSESSMENT OF ABIOTIC NATURE WITHIN TWO UNESCO GLOBAL Geoparks.

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The research started from the desk analysis of the UNESCO Global Geoparks, which included the geosites' geological and cultural background, their classification adopted at the time of application to the UGGps, and the geositemethodology. The proposed framework includes the selection of geosites "case study", field inspections regarding those selected geosites, and results in data; results have been compared with the preliminary analysis of the abiotic ecosystem services and the related classification of 25 abiotic ecosystem services. (Table 9- Greencircles) Through the collection of Data, Questions and Indicators, the field and desk research were combined and the preliminary classification of the representative geosites was gathered in a "database for geosite recording", considered to be a common framework for geosite classification between Italy and Norway; this record is the first product of this research (Blue Circle NI, Table 9). The research on existing biotic ecosystem classifications and applications and its subsequent comparison within the already proven methodologies related with abiotic ecosystem services assessment results in the analysis of the overall qualitative characters of the selected geosites. (Blue Circle NII, Table 9). The provisional analysis of the abiotic ecosystem (Blue Circle 2), the key questions and Indicator use and the application of existing scientific biotic service approaches to the abiotic features of the Geopark selected led to the detection of a conceptual model based on provisional abiotic indicators. The gathering of data, the final provisional assessment, led to the development of the monitoring-reporting system, which constitutes the third product of this research (Blue Circle NIII). The results obtained through this research could give a concrete benefit to the two Geoparks which were investigated. As the abiotic assessment shows, within the analysis of the four geosites selected, the abiotic ecosystem services play a relevant role in the interpretation, consequent geosite development, and overall land planning on behalf of Geopark managers and policy makers. The research final assessment method allows managers and policy makers, with the support of a multidisciplinary team, to preliminarily assess the territory in an innovative way considering climate issues, land use, geohazards, soil presence, water and food provisions, education and culture, all in one.

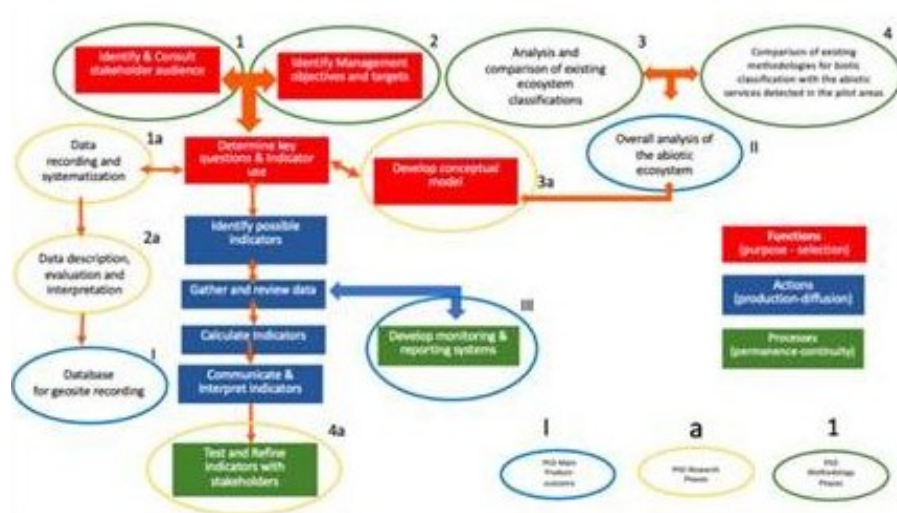


Table 9. Biodiversity Indicators Development Framework, from Biodiversity Indicators Partnership: (<https://www.bipindicators.net/national-indicator-development>) Adapted with PhD's methodology, Research Phases and Product, Gentilini S.

GEOFOODINITATIVE AND UNSDGS

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UNESCO Global Geoparks are part of Agenda 2030 and deeply committed to the Sustainable Development Goals (SDGs) fostering the protection of the planet and its natural resources, to achieve a better future for all. The essence of Geoparks is, in agreement with SGD 12, to “develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products”. UNESCO Global Geoparks act as incubators for best practices and innovative solutions to empower local communities and stimulate investment to enhance agricultural practices, value food systems, support SME’s, increase employment opportunities and better job conditions. These territories work in close international, national, regional and local cooperation, promoting partnerships and networking.

The GEOfood concept aims to strengthen the connection between the local stakeholders and the Geopark’s identity, in particular the main goal is to increase awareness of general public about the connection between the raw food and the local peculiar geoheritage: the GEOfood concept is developing targeted storytelling which underline the exclusivity of their geological heritage in connection with the local food and cultural tradition.

GEOfood is an innovative way to connect all targets of the population with the territory, food is an international language that anyone can understand; in fact, through the food we like to connect people with soil, nature and strengthen the food education towards km zero food and responsible use of the resources, within UNESCO Global Geoparks territory only.

The storytelling approach which is combining geological scientific interpretation with the agricultural food productions, and the interpretation of landscape geographical and topographical historical analysis with the fables told along the centuries to explain certain natural phenomena (ex. Thor wagon- wheels tracks in Magma Geopark for justify the ice retreat groove carved in the bedrocks) adapted to gastronomic traditions and strong cultural heritage identities can be transferred to other projects.

In 2019, Magma Geopark in cooperation with NaturtejoUGGp established the “manifesto” of values including sustainability criteria for GEOfood companies, using references from the Food Agricultural Organization (FAO, 2018) and AGENDA 2030 (U.N., 2015).

The manifesto of values, now translated in 20 languages, includes information about the connection between the UNESCO Global Geoparks and the United Nation Sustainable Development Goals, with specific focus on the ones related with food, climate change and education, particular with SDGs ns.2, 3, 4 ,5, 8,11, 12, 13,14, 17.

**GEO PARKS – CONSERVATION AND VALORISATION OF GEOLOGICAL HERITAGE SITES
“GEODIVERSITY ASSESSMENT IN THE BEIGUAUGGP: THE DETERMINATION OF
PEDOGEOCHEMICAL BACKGROUND FOR GEOLOGICAL HERITAGE MANAGEMENT”**

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This work aims to assess the geochemical hazard related to the natural presence of potential ecotoxic elements (PTEs) in the ophiolitic rocks and soils of the Beigua UNESCO Global Geopark (UGGp).

The studied area is the BeiguaUGGp that extends over 42 376 hectares, comprising the provinces of Genova and Savona (northwestern Italy) and including eleven municipalities.

The Beigua UGGp is mostly composed of metamorphosed ophiolites and their sedimentary cover, with minor occurrences of metamorphosed rocks of continental crust (gneiss and sedimentary carbonate successions). All the lithologies are capped by limited outcrops of clastic sedimentary rocks and Quaternary sediments. The Beigua UGGp meta-ophiolite (i.e., Voltri Massif Auct.) is among the remnants of the Tethyan ophiolites in the Mediterranean area, and one of the main ophiolitic complexes of the Italian Alps–Apennine system. The most distinctive feature of the BeiguaUGGp is its geodiversity, which includes a large variety of geological environments, landscapes, rocks, minerals, fossils, and soils. The remarkable geodiversity of the Beigua UGGp is testified and well represented in fifty-four geosites, twelve of which already included in the National Inventory of ISPRA (Italian Institute for Environmental Protection and Research).

The research has been performed throughout a mineralogical, lithological, and geochemical characterization of selected ophiolitic geosites to i) evaluate the pedogeochemical background levels (NBLs), ii) compare the NBLs with the thresholds values of national and international laws, and iii) investigate the source of PTEs by discriminating natural sources (i.e., geological compatibility) from possible anthropogenic contamination.

Twenty-five bedrock and soil samples have been collected from five geosites comprising ultrabasic rocks (peridotites and metamorphic serpentinites), basic rocks (eclogites, and metarodingites), and ophiolitic conglomerates. Rock and soil samples have been analyzed by means of optical and electron microscopy (PLOM, SEM-ESD), X-ray powder diffraction (XRPD), X-ray fluorescence spectroscopy (XRF), inductively coupled plasma (ICP-) optical emission spectroscopy (-OES) and atomic absorption spectroscopy (-AAS).

The results show a content of Ni, Cr, and Co in ultrabasic rocks an order of magnitude above the threshold values, whereas eclogites and metarodingites have local enrichment for Cr, Co, Cd, and V.

All these elements in the studied soils are contained within primary minerals or secondary authigenic phases deriving from pedological weathering of the bedrock. In particular, Ni occurs within serpentine, olivine, Ni-Fe alloys, Ni and Fe-Ni sulfide; Cr has been found within serpentine, pyroxenes, spinel group minerals, and Al-cromite; Co occurs within pentlandite and Co-bearing pyrite; V has been detected only within pyroxenes.

Based on these results, all the detected PTEs are compatible with the natural composition of the bedrock and its natural evolution during the development of the soil profiles. Moreover, significant source of anthropogenic contamination has not been found.

These results will be included in a georeferreddatabase of BeiguaUGGp'sgeosites in a specific section concerning environmental data. In fact, these data could represent an essential information not only to evaluate the potential geochemical hazard, but also for the management and conservation of geological heritage as well as for the valorization of the territoriality of wild and agricultural soils of an area (terroir).

SUSTAINABLE TOURISM AND DEVELOPMENT STRATEGIES IN THE BURREN AND CLIFFS OF MOHER UGGP.

Carol Gleeson, *Geopark Manager, Burren and Cliffs of Moher UGGp, Clare County Council, Ennistymon, County Clare, Ireland.*

The Burren and Cliffs of Moher UGGp designation was applied to a territory with an already well-developed tourism industry. The aim of the Geopark programme is to implement a more sustainable approach to the existing tourism industry and to future tourism developments. The approach to this programme is multi-faceted and involves the collaboration of a variety of stakeholders. This presentation will focus on three key actions of the Geopark team in sustainable tourism and local development; 1. the Geopark Code of Practice in Sustainable Tourism for tourism businesses, 2. the Global Sustainable Tourism Council Destination Certification for the Geopark and 3. the GEOfood programme for developing local food production within the Geopark.

1. Tourism business play a vital role in the development of sustainable tourism in destinations and together with local businesses the Geopark developed a Code of Practice for Sustainable Tourism which encourages businesses to work together **to develop a sustainable ethos and practices, sustainable tourism experiences for the visitor and environmental action plans that include waste, water, energy management, adoption of the Leave No Trace principles, increased use of local produce and services and active participation in conservation actions.**
2. **The Geopark and the County Administration has recently applied for Destination Certification accredited by the Global Sustainable Tourism Council.** The Geopark has partnered with the Atlantic Technical University Sligo in the creation of a dynamic system of assessing and recording the sustainable tourism policies and activities based on the Global Sustainable Tourism Councils Destination Management Criteria. The system tracks a range of management, socio-economic, cultural and environmental indicators and is overseen by a Green Team of local tourism and community stakeholders.
3. **In support of increasing the economic, social and environmental benefits of developing local food produce, the Geopark recently joined the international GEOfood programme which promotes local food produce within UNESCO Global Geoparks amongst local producers, restaurants, retailers, local communities and visitors.**

All three actions support several of the UN Sustainable Development Goals and the Geopark has been chosen to be an SDG Champion as part of an Irish Government nationwide SDG promotional initiative.

Keywords: Sustainable tourism, Code of Practice, GSTC Destination Criteria, Green Team, GEOfood, SDG Champion.

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RUPKO'S GEOLOGY SCHOOL IN PAPUK UNESCO GLOBAL GEOPARK

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The conservation and protection of the geological, but also natural and cultural heritage, is one of the main objectives of the UNESCO Global Geoparks. One of the most effective ways to reach this objective is through education. Since 2019 we have started with the educational programme "Rupko's Geology School" with the aim to raise awareness of the rich geological heritage and unique character of the Geopark's territory. The Programme is implemented by a joint effort between Papuk UGGp staff and local school teachers with a deep understanding of geopark activities. The Program is intended for elementary school students in lower grades, where they have the opportunity deal with different topics such as stratigraphy, fossils, minerals or volcanoes from the last 440 million years of the Geopark history. Throughout the story, children are guided by Rupko, the mascot of the geopark, our little curious explorer. This year we improved the programme with the newly published booklet "Geo-guide for kids"(Fig.1) which should give the students a good introduction before going in the field to visit some geosites equipped with special "Rupko's School" educational panels. The Program takes place outdoors, with a shelter on Jankovac serving as the base for activities. In the introductory part, children are introduced to the area they are in, the Jankovac valley, the Papukmountain, and the Slavonian hills. The beginning is related to the story of how and why mountains and Papuk were formed (Fig 2). There is an educational board of Rupko's geology school next to the shelter, explaining how mountains are formed, and through a puzzle game of assembling our continents, children can see how they "collided and created mountains." After that, children learn what mountains are made of – rocks. We will go to the nearest rock formation and use a hammer to take a few pieces of rock and compare them with those on the constructed geological pillar. We will find the oldest rock on Papuk and in Croatia, and then the youngest – tufa. As we go towards tufa deposits, we will see different carved figures along with their legends (intangible heritage). On the way back, we will also show what fossils are and how they are formed, with a story about dinosaurs – extinct reptiles, the story of the "Pannonian Sea," and making shell imprints in clay. At the end, everyone will receive a small diploma, becoming young geologists together with Rupko.

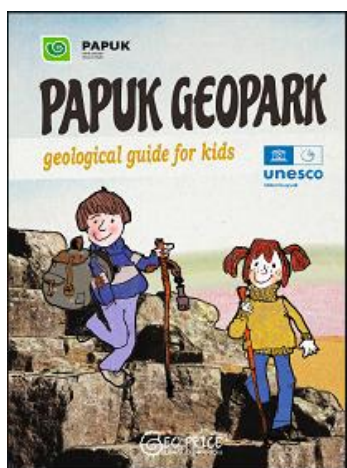


Fig 1. Geological guide for kids



Fig 2. Workshop „How the Papuk was formed“

**PUTTING THE CITIZEN BACK IN SCIENCE: EXAMPLES OF EDUCATION AND SCIENCE
COMMUNICATION IN A CANADIAN UNESCO GLOBAL GEOPARK**

Caleb Grant

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UNESCO Global Geoparks have a unique opportunity to bring the wonders of the natural world to the visiting and local public. However, geology, and science in general, can be difficult topics for non-experts to wrap their heads around! This often creates a gap, or a divide, between the scientific community and the public. But so many of the issues that we face today in Canada, and around the world, have their roots in natural science. Therefore, breaking down the barriers to participation has been a priority for the Geopark team. The integration of accessible citizen science initiatives into the Geoparks outreach and educational programs has helped visitors and locals take pride in the Geopark region and feel a sense of involvement in the goals of the Geopark. Working through the National program Ocean Wise, Geopark residents are able to complete shoreline cleanups and help to profile plastic waste and inform National policy development. Utilizing the free app iNaturalist to empower citizens to identify a variety of species of plants and animals helps researchers expand the Biodiversity profile of the region and informs future areas for possible conservation. Finally, local collaboration with community members, partner organizations and Biologists to participate in species at risk monitoring and conservation helps residents understand what endangered species share the Geopark region with them. From our experience, it has become more and more apparent that the key to breaking down barriers between the academic and local populations in the Geopark community is in the implantation of accessible programming and an emphasis on citizen science.

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ASPIRING GEOPARCTERRES D'HERAULT

Gravat—Hodan Shona, LEVEQUE Gaëlle

The department of Hérault, located on the Mediterranean coast in the south of France, has a particularly rich natural and cultural heritage.

Beyond the many geological sites of international interest, the subsoil here has almost all the types of rocks allowing us to follow 600 million years of the history of our planet (LE GOFF, 2014). The outcrops are of remarkable quality and the territory has the specificity of presenting the largest continuous outcrop surface of Permian continental basin's pelites in Europe (LOPEZ, et al.,2008).

The "Geoparc Terres d'Hérault" approach on the territory is at the initiative of the environmental education association "Demain la Terre!". From 2022, it has been decided that the Hérault Department would ensure the support and animation of it. A dedicated team has been in charge of developing this dynamic, which illustrates the Department's positioning as a facilitator and bearer of the approach in collaboration with all the territorial partners.

Such support is consistent within the Departmental Council with regard to the territorial complexity of the recommended perimeter and its cross-cutting skills meeting the objectives of the Unesco Global Geoparks. This project is therefore an opportunity to promote the skills and actions that the Department already offers on its territory and also create a synergy between all the local partners and projects.

This oral presentation will present the news of this dynamic in progress on our territory as well as the actions put in place in anticipation of the application for the label « UNESCO Global Geoparks ».

THE OUTDOOR LABORATORY FLEX AS A MODEL FOR IMPLEMENTING UN SUSTAINABLE DEVELOPMENT GOALS IN EDUCATIONAL WORK OF GEOPARKS

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With increasing ecological, economic, social, and cultural challenges, the concept of sustainable development plays an increasingly important role. With this in mind the University of Siegen/Germany has set up a specific offer for school classes to learn about nature, natural phenomena, and sustainable development in the context of science education.

The FLEX (figure) is located outside a small village close to a forest. A shed is built on a large meadow with two springs, a small stream and a pond. The shed was re-modeled into a small room for experiments ("laboratory") and equipped with extensive experimental material from simple shovels for the exploration of the ground in the elementary sector up to a mobile photometer for chemical analysis of the environment. Wicker tepees, Benjes hedges, a phenological hedge, a herb bed, a small field, and a "green seminar room" are completing the location. Energy supply takes place self-sufficiently through solar modules, fuel cells and a wind wheel.

In cooperation with the nature park "Sauerland Rothaargebirge", among others, various offers for school classes have been developed. The school classes usually come to the FLEX for a day's practical training. Here the pupils deal with phenomena from the surrounding landscape and nature. They explore soil, air and water and carry out experiments. On the one hand, the experiments serve to gain scientific knowledge. In addition, the students also deal with ecological, economic, political, social, and cultural issues.

For example, the students examine the ground and doing this they discover clay near the pond. They think about how it was formed there. They dig it up, make things with it, for example, by shaping it into bricks, and then fire it on site. They talk about the material structure of clay, but also about the role of clay in different religions, cultures, its importance in the construction of houses and the value that clay can have as a sustainable building material. In this way, the students also learn in an exemplary way the path from a resource to a final product, which in many cases remains hidden from them, as for example with the ingredients of a cell phone, which the vast majority of students use without reflecting on the origin of the valuable raw materials from nature. In this project as well as in other projects a variety of UN sustainable development goals (SDGs) can be addressed in different subject areas.



Thereby the immediate closeness to the environment and nature provides an extra advantage in times when students spend a lot of time with new media and in closed rooms in artificial places.

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THE GEODIVERSITY INDEX MAP AS A TOOL FOR GEOTOURISM PLANNING WITHIN THE SESIA VALGRANDEUGGP

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To ensure the conservation of geodiversity and geoheritage, UNESCO Global Geoparks are increasingly recognised as a good strategy. Geoheritage refers to the elements of the natural geodiversity with some value for humanity, while geodiversity refers to the range of geological features and processes within a given area.

Although there are links between the two concepts, the extent of their interrelationship has not been extensively researched. The purpose of this study is to investigate the relationship between geodiversity and geoheritage, focusing on the potential application of the geodiversity index map as a tool for geoheritage conservation and geotourism planning. The study area is located in the Sesia Val Grande UGGp, in the municipality of Alagna Valsesia, at the foot of the Monte Rosa massif (Western Alps). Alagna Valsesia is a mountainous area of great geological and geomorphological importance, with several geological features and geosites of scientific and cultural value.

Following a revised version of the methodology of Forte et al. (2018), a geodiversity index map was produced. The map was then overlaid with a map of the geosites in the area, which had been prepared previously. The geosites were identified and then mapped thanks to field surveys and literature review. The correlation between the geodiversity index values and the number of geosites was analysed using correlation statistical analysis, in particular the Pearson, Spearman and Kernel correlation tests were applied and compared.

The results of the analysis show that there is no significant correlation between the geodiversity index class and the number of geosites. This indicates that it may not be possible to use the geodiversity map as a tool for geotourism planning or geoheritage protection. This could be because the identified geosites represent a heritage based on factors such as natural, cultural, historical and educational significance, which are not necessarily related to the abundance of geological features themselves.

The results of the study suggest that in order to identify geoheritage sites, it is necessary to rely either on field trips and surveys or on a study of the area using new technologies such as remote sensing and Geographic Information Systems (GIS). In order to protect the geosites, it is also necessary to include them in an inventory or an active database in order to monitor the sites. This approach also allows greater attention to be paid to the social and cultural dimensions of geoheritage, such as how local communities value and use the geodiversity features available in the area. Although the geodiversity map could not be a useful tool for geotourism planning and geoheritage protection, it can show the richness of geodiversity within a given area and become a complementary tool in the study of biodiversity, given the relationship between geodiversity and biodiversity demonstrated in other studies.

In conclusion, this study provides important insights into the relationship between geoheritage and geodiversity, shows that the geodiversity map could not be a proper tool for the identification and protection of geoheritage, and highlights the need to better define standard criteria for using it to its full potential.

ARARIPE GEOPARK: HOLISTIC METHODOLOGICAL PROCEDURES FOR ENVIRONMENTAL MANAGEMENT AND ASSESSMENT IN GEOPARKS

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The UNESCO Global Geoparks Program is based on the recognition of unique territories, characterized by geological aspects of international value, which must be under an integrated management, based on a approach that addresses conservation, education and sustainability. In this sense, the development of aggregation methodologies for its territorial application has been a great challenge for geopark managers. In the AraripeUGGp, a multidisciplinary team started the construction of a methodological set that will consider the specificities of the territory, in a time that could be replicated in other territories. In 2018, the first product was presented, called Matrix of Management Priorities and Visitation Impacts, capable of consolidating valuations through indicators established according to the demands of visits.

The model infers the analysis based on: (i) evident impacts, (ii) management profile, (iii) visitor demand and (iv) zone of activity. From a quantitative perspective, it is possible to determine the priority of geosite management to optimize resources and mitigate impacts. In 2021, the Ecosystem Health Provision Spectrum, another component of this methodological set, sought to identify the potential and opportunities for the health of ecosystems, classifying the geosite trails and mapping other trails in the territory. It is a method based on the understanding of networks for complex systems, which analyzes the proximity and strength of biotic and abiotic variables, natural phenomena, infrastructure, and sensory experiences, bringing to light the positive and negative configuration of these associations from a nonlinear perspective. In 2022, a complementary method was presented that considers the classification of the effort index and the biomechanical overload based on the user-trail interactions, focusing on an active and healthy lifestyle, from a trans disciplinary perspective in the evaluation of a trail circuit in the territory. In this way, we present a replicable territorial management system designed to be transversal in the promotion of geotourism, geoeducation, geoconservation, culture, health and well-being, in an aggregating, sustainable perspective and in communication with the mission of a UNESCO Global Geopark.

EFFECTS OF THE APPLICATION OF CARIRI LIMESTONE POWDER IN UROCHLOA MOSAMBICENIS
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In Cariri Cearense, the extraction of laminated limestone is historical, giving way to the development of an ornamental product called "cariri stone", used in civil construction. In more than thirty years of exploration, only in the cities of Nova Olinda and Santana do Cariri, 2.5 million tons of tailings were generated. With the recognition of the Araripe GeoparkUGGp, and the establishment of a sustainable territorial development program, the initiative was given to rethink the extraction policies of these materials. The goal is to transform limestone waste into useful products, reducing environmental impacts and generating income. Thus, this study proposed the recycling of limestone waste for its application in acid soils, correcting the soil pH through the liming technique, reducing, or eliminating the need for formulated chemical fertilization. The study took place in 2021, experimentally and in the laboratory, this last stage carried out in the municipality of Cedro, State of Pernambuco. The environmental diagnosis of the experimental area is similar to the dominant profile in the semi-arid region, identical to the scenarios found in Nova Olinda and Santana do Cariri. First, macro and micro chemical analyzes were performed on four samples of limestone dust from tailings, which indicated high concentration of calcium and low concentration of magnesium, characterizing the substrate as "calcitic limestone". Subsequently, in a uniform area of 4 ha (A), 2 subareas of 2 ha (A1 and A2) were subdivided, one of which (A1) was subjected to the preparation of calcareous powder, distributed by broadcast. After a period of three months, two variables were analyzed: the mass of green matter and the weight of seeds. Considering the comparison of three 1m² blocks from the two subareas, the average weight of green matter in A1 was 3.22 kg, against 0.77 kg in A2. Regarding the weight of the seeds, the values were, respectively, 35.83 kg, against 17.40 kg. Thus, it is concluded that the materials obtained from the limestone residue can be an alternative as a low-cost agricultural corrective, especially due to the satisfactory agronomic response in its application.

UNESCO ARARIPE GEOPARK RACING CIRCUIT AS A STRATEGY FOR GEOTOURISM, SUSTAINABLE REGIONAL DEVELOPMENT AND THE PROMOTION OF A HEALTHY LIFESTYLE

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The UNESCO Global Geoparks Program is an innovative proposal for sustainable management and development. In its multiple territorial promotion strategies, geotourism stands out in the context of valorization and preservation of the landscape as a destination, with the promotion of tangible and intangible heritage. Recently, according to the World Health Organization, and based on several studies, relevance has been given to the development of a community culture focused on adopting an active and healthy lifestyle. The rapprochement with nature, with the offers of the ecosystem, together with the potential of the territory for the practice of "green exercise", already makes this issue a fundamental strategy for collective health and environmental conservation. Thus, Araripe UGGp and Cariri Extremocompany created the Araripe Geopark Racing Circuit, to boost sports practice in the territory, promoting geosites with innovation and aligned with the "Global Goals" of the UN 2030 Agenda.

The objective is to collaborate for a healthy life and the well-being of the population, in the sustainable context of ecosystems. The racing circuit involves communities and visitors in trail run and mountain bike events, practiced in natural landscapes. Each circuit test is associated with a geosite or nature trail in the geopark territory, especially those of the Araripe National Forest. The Circuit has already been held in Juazeiro do Norte, Crato, Barbalha and MissãoVelha. Between 2018 and 2022, six stages were held, with the participation of more than 5.000 athletes and an audience of more than 60.000 spectators. The circuit has already handled more than US\$600.000 in the territory. The event model, which considers the management of impacts on the territory, involves inclusive and educational actions, and promotes natural spaces, has become a benchmark and case for other sporting events. With expressiveness on the sports scene and high-level organization, the event is already taking place at the level of the country's major sports competitions, attracting elite athletes from all national states who, naturally, become extra motivations for the success of the program in the territory and in the general medias.

GEOEXPLORER - NEW EDUCATIONAL TOOLS FOR GEOPARKS

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The Erasmus+ project GeoExplorer aims to enhance the quality of teaching and learning in secondary schools through an innovative approach to learning, science and language education and the method of language-integrated learning. Besides school partners, UNESCO Global Geopark Styrian Eisenwurzen (Austria), UNESCO Global Geopark Odsherred (Denmark), Magma UNESCO Global Geopark (Norway), and Idrija UNESCO Global Geopark (Slovenia), are part of this cooperation. An important objective of this project is the development of new teaching methods and tools for secondary school teachers and language teachers. This will involve the use of practical workshops, free "toolboxes" and training for teachers, students as well as nature educators.

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MOVEMENT.AT – THE MOVING MOUNTAINS

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Landslides are common processes in mountainous terrain. They occur at a broad range of magnitudes and frequencies and form an integral part of the long-term destruction of mountain areas. To human societies, such phenomena may result in risks and even disasters, having triggered a huge bulk of research on landslide hazard and risk analyses. However, landslides may also represent significant natural and cultural heritage and offer services to society, aspects that are under-researched and may be included in the yet rather scarcely used concept of geosystem services. In this context, landslides also help us to learn how Earth surface systems are functioning. UNESCO Global Geoparks represent ideal environments of exploring and highlighting geosystem services related to landslides, particularly in Austria where the three existing UNESCO Global Geoparks (Karawanken/Karavanke, Erz der Alpen, Steirische Eisenwurzen) are characterized by the occurrence of a broad range of landslide types and magnitudes.

On this basis, the objectives of the movemont.at project are defined as follows:

- 1) We will elaborate an integrated theoretical framework considering landslide processes and their ecological and societal relevance in a comprehensive way, including chances and risks over various scales in time and space. In this context, we will pick up the concept of geosystem services, which has repeatedly appeared in the literature as a spin-off term of the more broadly employed ecosystem services, but not yet come into more widespread use.
- 2) We will map and characterize the landslides in each of the involved UNESCO Global Geoparks, using a common methodology and exploiting existing databases, as a basis for the further steps.
- 3) We will develop an integrated tool set for the GIS-based modelling of landslide preconditioning and dynamics, considering a broad range of process types, temporal and spatial scales. Thereby, we focus on broad-scale analysis of stress distribution in mountains and its role for slope stability, and on the simulation of the dynamics of slow-moving mass flows and complex deep-seated landslides and slope deformations - fields which have yet been rarely considered in operational GIS-based landslide modelling tools.
- 4) We will merge all the research outcomes to develop and implement strategies to better use landslide phenomena for environmental education, employing the involved UNESCO Global Geoparks as pilot areas. The movemont.at project will be organized into five strongly interlinked work packages, each of them associated to one of the objectives. It will be implemented by an interdisciplinary team of scientists of the University of Graz and the University of Salzburg, and environmental education specialists from the three involved UNESCO Global Geoparks. The project will be embedded into the international research and geopark landscapes through various collaborations.

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MERSIN CILICIA GEOPARK: AN ASPIRING GEOPARK FROM TURKEY

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The proposed geopark is located within Mersin's Mut and Silifke towns in Eastern Mediterranean Turkey. The geopark lies on the Central Taurus Mountain Range's southern slopes. From 1600m on the NW Central Anatolian Plateau and 2500m on the NE Bolkar Mountains all the way down to the Mediterranean. The geopark area is known among geologists as the "Mut Miocene Basin" because of its extraordinarily well-preserved marine-continental records of successive coral reef strata complemented by continental deposits. The concept of establishing a geopark in the territory stems back from a 2012 report by the MTA-General Directorate of Mineral Research and Exploration. The Mersin Metropolitan Municipality's long-term efforts are performed under the Mersin Cilicia Geopark program currently.

The name of the geopark is derived from the ancient name of the region, "Cilicia Trachea," which means "Mountainous Cilicia." Mersin and Mut get their names from the Turkish counterpart of the Mediterranean bush "Myrtus communis." The name Silifke / Seleucia comes from Seleucus I Nicator, one of Alexander the Great's generals.

The Cilicia Geopark contains internationally notable geological, geomorphological, and related archaeological and cultural heritage sites. Karstic geology and geomorphology constitute the backbone of geosites such as canyons, subterranean rivers, caves, sinkholes, monasteries, ancient cities, and cave churches from the Early Christian Period.

The Cilicia Geopark's geodiversity is spatially grouped around five key geocenters. Each geocenter hosts several other thematic geosites clustered in vicinity.

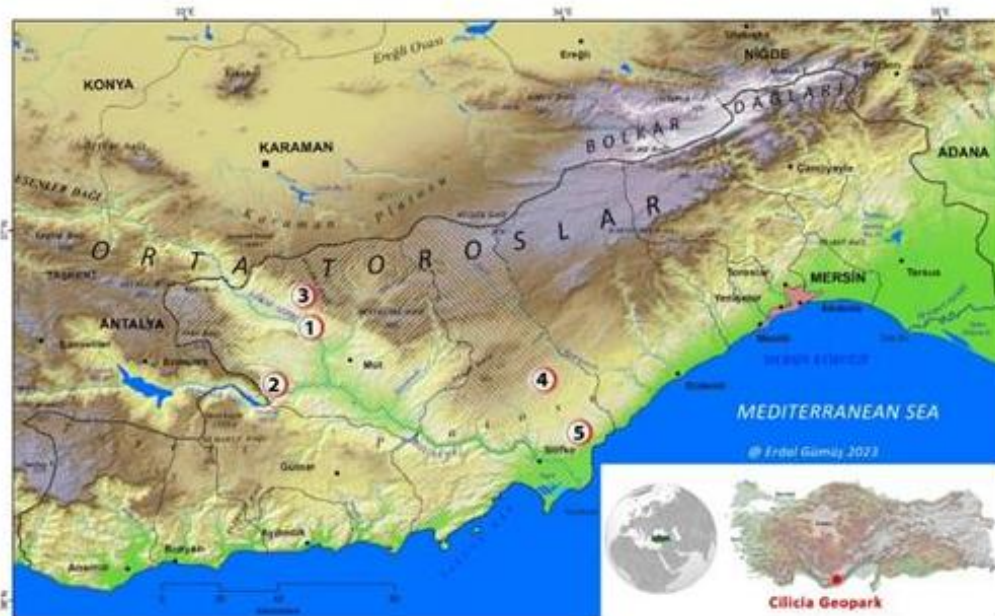


Figure: Mersin Cilicia Geopark and major geocenters location map: 1) Derinceay Canyon, 2) Yerkopru Waterfall, 3) Alahan Monastery, 4) Ancient Olba Ruins, 5) Underworld Sinkhole.

ZHIJINDONG CAVE UNESCO GLOBAL GEOPARK

Guo Jianeng

Zhijindong Cave UNESCO Global Geopark is located in Zhijin County, Guizhou Province, China. It covers an area of 183.31 km², having an elevation of 900~1670m. The Geopark first opened to the public in 1980 and became a Global Geopark in 2015. Zhijindong Cave is composed of three geomorphic units, Zhijindong Cave, Qijiehe River and Dongfenghu Lake which represent different karst development processes.

Zhijindong Cave Geopark is rich in geological heritage and is famous for karst landscapes, which can be generally classified into 11 categories, many of which are of international significance. It is one of the outstanding representative places to reflect the evolution of cave karst and cave chemical sediment, and it is also the most distinctive natural scenery and an important area with aesthetic value among cave karst. All geoheritages have been developed in the Lower Triassic Series marine carbonatite stratum and distributed intensively in such three karst geomorphic units as Zhijindong Cave, Qijiehe River and Dongfenghu Lake as well. These geoheritages constitute a comprehensive geopark integrating majestic, typical, beautiful and precious plateau karst landscape and colorful human landscape as well as biological landscape with caves, gorges, natural bridges and tiankengs as its core.

COSTA QUEBRADA ASPIRING GEOPARK: FROM A CIVIL SOCIETY INITIATIVE TO A BROAD PARTNERSHIP

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Costa Quebradaa UGGp in Cantabria, Spain, is an open-air science laboratory that showcases a diverse range of geological, cultural, natural, scientific, and educational assets. It offers a reasonably complete stratigraphical sequence for the Cretaceous period and features a rich array of coastal landforms within a short distance, making it an ideal site for observation and study. The geopark's main geological sites are protected by several existing protected areas, emphasizing the importance of preserving its natural heritage. It encompasses a wide variety of coastal landforms, including cliffs, beaches, dunes, estuaries, and more, providing a comprehensive display of coastal geomorphology. This succession of coastal landforms represents different stages in the evolution of a retreating coast.

The geopark's accessible geology and educational interpretation make it inclusive and appealing to a broad audience. In addition to its geological significance, the area also holds historical and cultural importance, with connections to prehistoric human populations and nearby World Heritage sites -such as World class cave paintings of Altamira Cave- that actively collaborate with the geopark due to the complementarity of the issues they address.

The aUGGp is the result of a civil society initiative that, concerned about the survival of the landscape, culture and geological heritage of the area, aims to advance its conservation through the establishment of alliances with the many stakeholders involved. A broad partnership has developed in order to operate the geopark. All local and regional public administrations, the environmental organizations, women's associations, private companies, etc. have been engaged with the geopark.

All the latest advances are presented in matters such as visibility or partnership, in addition to a reformulation of the management body.

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ITINERANT EXHIBITION ABOUT GEOLOGY IN THE BEAUJOLAIS UNESCO GLOBAL GEOPARK

Hélou-Frugier Floriane

The Beaujolais UNESCO Global Geopark has set up this year an itinerant exhibition about geology. One of the purposes is to offer an equal access to the knowledge about geology for every inhabitant of the territory, both children and adults. The genesis of this event took some time, mainly due to the fact that it was conceived by several hands and that the various elements had to be collected and/or created. The Beaujolais geological history is quite complicated, the geographical and climatic conditions of the region have varied considerably over the ages, which is also why it's particularly fascinating. Explaining it requires a bit of pedagogy!

The presentation will cover all these aspects of preparing the exhibition, as well as showing some examples of the objects and panels on display.



LOCAL ECONOMIC DEVELOPMENT AND COMMUNITY INVOLVEMENT IN TAISHAN GLOBAL GEOPARK

Ding Haiyang, Niu Jian, *Management Committee for Taishan UNESCO Global Geopark*

Taishan UNESCO Global Geopark, covering an area of 418.36km², is located in central-western Shandong Province. In 1987, Mount Taishan was named the world cultural and natural heritage site by UNESCO. It became a global geopark in 2006. Home to numerous geoheritage and cultural relics, Taishan is an epitome of China's colourful culture. After the expansion of Taishan global geopark in 2018, in addition to taishan's main geoarea, the geopark includes three towns with 100,000 residents. Based on the protection of taishan geoheritage and other heritage resources, rationally using taishan resources to drive the local economic development is an important subject. In recent years, Taishan global geopark has adopted a series of policies and measures to promote the sustainable development of Taishan global geopark. 1. Carry out environmental education, improving the public's awareness of protecting heritage resources and stimulating the public's enthusiasm to participate in the construction and management of Taishan global geopark through lectures and distribution of publicity materials; 2. Design more tourism routes to attract more different types of tourist groups, such as popular science routes, education and research routes, and hiking routes; 3. Carry out geoheritage investigation and build geological and cultural villages, attracting more tourists to the villages to drive the economic development of village; 4. Promote the Development of Tourism Products with Local Characteristics. Some local businesses helped in the design and development of geopark souvenirs based on specific geosite features and the natural setting of Taishan Geopark; 5. Various kinds of geotourism activities have been carried out by making strategic partnership agreements with local companies. Cooperated with local companies, our geopark has designed special routes to these sites for self-picking and appreciating the local special products.

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VIRTUAL TRAVEL CASE OF SAIMAA UNESCO GEOPARK

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Tourism and especially sustainable nature tourism are growing trends all over the world and even more people are interested in nature and its geological heritage of preservation.

Digitality combined with nature tourism brings a lot of new possibilities for the sector. By utilizing of digitalisation example discoverability of services and more vivid experiences are much easier.

Virtual travelling brings almost unlimited possibilities to tourism industry, because in the digital world there is no need to consider the limitation of real life. Although virtual travel doesn't replace the feeling of real travel, it can replace trips to places which are suffering from mass tourism and get to know interesting travel destinations from a new perspective.

Virtual reality (VR) is a computer-generated environment with scenes and objects that appear to be real, making the user feel they are immersed in their surroundings. 360 degrees images and videos are normally used in the implementation of virtual content. Virtual reality environment is perceived through a device known as a virtual reality headset or helmet.

Currently the most well-known virtual technologies are augmented reality (AR) and virtual reality (VR).

Virtual travel case of Saimaa UNESCO Geopark

The Saimaa Geopark area is home to nine unique municipalities and one of them has recently produced a virtual travel video. The objective of the work was to produce a virtual travel video, of Lappeenranta Geopark destinations. The video was produced using the Wonda VR -platform. In addition, the work aimed to increase the knowledge of the residents of Lappeenranta of regional nature destinations and to develop new content for the tourism industry.

The functional part of the work was carried out using a 360 degree camera for taking pictures and videos, after which the materials obtained were used in creating a virtual trip in the Wonda VR -platform. The total number of Geopark sites in Lappeenranta is nine and each item was captured on the video to give the viewer a complete understanding of the site. The work was unique and worth developing because a virtual nature trip of Geopark destinations has not yet been developed.

GEOLOGICAL AND ECO-CULTURAL HERITAGE OF SMALL ISLANDS ON THE KOREAN PENINSULA: BAENGNYEONG AND DAECHEONGASPIRING UNESCO GLOBAL GEOPARK

Han Daik

There are three islands located at the northwesternmost tip of South Korea. These islands are called Baengnyeongdo, Daecheongdo, and Socheongdo from the north respectively, and part of Ongjin-gun County, Incheon Metropolitan City. They are located 4 hours by boat (222km) from Incheon Coastal Passenger Terminal and 13 Km from Jangsangot Cape in Hwanghae-do, North Korea. About 6,300 residents live on the islands, which cover 66.87 Km on land and about 305 Km including sea. Although the total area is not big, there are many geological heritages with outstanding scenery, which was the main reason for being designated as a National Geopark in 2019.

Due to their geographic location, the three islands contrast with the Sangwon Supergroup in North Korea. The main rock formations are Neoproterozoic sedimentary rocks such as sandstone and mudstone, mafic rocks, dolerite, marble and stromatolites; Miocene basalt rocks with mantle xenoliths; and Quaternary alluvial layers. The three islands have a variety of coastal features ranging from coastal cliffs up to 70 meters high to sea arches, sea stacks, sea caves and coastal dunes.

Ecologically, they are located at the entrance to the Korean Peninsula from the Yellow Sea, serving as part of the East Asian-Australasian Flyway, and endangered migratory birds such as black-faced spoonbills and european oystercatchers use them as a place to feed, rest and breed. In addition, Baengnyeongdo Island is the largest habitat in South Korea for spotted seals, which are designated as protected species not only in South Korea but also in North Korea and China, and is home to all five of Incheon's flagship species.

The historical and cultural heritages are also diverse. Shell mounds found in the soil covering the basalt area of Baengnyeongdo Island are archeological evidence of human habitation dating back to prehistoric times. Historically, Daecheongdo Island was the childhood exile of the Emperor Shun of Yuan, the last monarch of the Yuan Dynasty. Literarily, it is the setting for the classic Korean novel Simcheongjeon. Culturally, the inhabitants have adapted to the strong winds by using slate, which is abundant on Socheongdo Island, for roofing, rather than the bark of oak trees as inland.

The ecological, historical and cultural heritages described above are linked to the geological heritage of the region and have developed into the unique culture and life of Baengnyeongdo, Daecheongdo, and Socheongdo Islands. However, as the settlement environment is unstable due to its remote location from the inland, Incheon plans to promote regional development by applying for the designation of the area as a UNESCO Global Geopark based on UNESCO's brand value and the sustainability of the geopark.

STRENGTHENING INTER-REGIONAL COLLABORATION WITHIN THE IJEN GEOPARK AND ENHANCING THE ROLE OF LOCAL GOVERNMENTS IN BUILDING A STRONG GEOPARK MANAGEMENT INSTITUTION

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Ijen aUGGp has a long history in the formation and development. Ijen aUGGp was initially established by the Banyuwangi Regency which developed the Banyuwangi National Geopark in 2018. The development of the Banyuwangi geopark is very strategic, with one of the main sites and international values being the presence of bluefire, the most acid crater lake, and the unique history of the volcano formation process that located in the Ijen Mountain area. The Ijen Mountain is geographically located between two regencies, Banyuwangi and Bondowoso. Furthermore, in the proposal to apply for UGG, Bondowoso Regency must be involved. The big challenge is felt because the two regencies have a cultural history that is less harmonious due to the history of past kingdoms, and today's challenge are differences in human resource abilities, tourist facilities, and access facilities. Efforts to unite the concept of geopark development involve the significant role of the provincial government, particularly in coordination and development support, so that field implementation can run smoothly. The geopark development model with a regional scale has the potential to occur in other geopark areas. This is because geological history cannot be separated from the boundaries of a region. The research problem to be raised is how the coordination pattern between regions in strengthening the management body of Ijen aUGGp. This research was conducted using a descriptive approach by explaining each stage of the coordination process until the Ijen aUGGp is ready to be proposed and evaluated by UGG. The results of the study found three patterns of coordination by each regional government in terms of: 1. Determining the concept of structure and appointment of daily executive chairman, 2. Funding patterns in the management body's activities, and Strengthening short-term and medium-term geopark development planning. Structurally, the institutional agreed to be filled by representatives from each region coordinated by the province, the selection of the daily executive chairman in the initial period agreed to be done alternately with consensus within a period of 2-4 years. For operational funding of Ijen aUGGp implementation, it is jointly funded by each regional government and provides opportunities to use other legitimate funding sources such as CSR, philanthropy, etc. In the implementation of Ijen aUGGp activities, a masterplan reference is used so that short-term and medium-term activities can be monitored for development and evaluation of their success.

GEPARKGUIDEAPPLICATION – NEW TOOL FOR LOCAL DEVELOPMENT OF CROSSBORDER REGION

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Geopark guide is a new web- and mobile application, created in the frame of INTERREG SI-AT project with the acronym “NatureGame”, funded within the framework of the cooperation programme Interreg V-A Slovenia-Austria 2014-2020 by the European Regional Development Fund and funds from the province of Carinthia. Main goal of a new joint tourism Geopark guide web- and mobile app is better marketing of cross-border region and better guest service. It is implemented in a game format, making the playful experience even more attractive and innovative for visitors and locals of all age groups.

New web- and mobile application integrates various guides, so called tourGUIDE, adventure GUIDE and geo.dom GUIDE. TourGUIDE involves detail descriptions, informations and coordinates of 13 daily stages of 265 km long cross-border Karawanken/Karavanke Trail. Adventure GUIDE include presentations of all important Geopark Karawanken/Karavanke excursion destinations and animation modules supported by engaging and awareness-raising animation clips. Geo.dom GUIDE is designed to present the Geo.Dom – new multifunctional Geopark Karawanken/Karavanke visitor centre with innovative/interactive exhibition for knowledge transfer, information, entertainment and even gastronomy, located on the cross-border Petzen-Peca mountain, in the middle of the Geopark Karawanken/Karavanke, near mountain station of the cable car, with an altitude of 1708 m.

The app is available in three different languages (Slovenian, German, English) and can be accessed via the Play Store or QR code. It is also a part of the general presentation of “NatureGame” project on the websites of all involved project partners and the Karawanken/Karavanke UNESCO Global Geopark. Geopark guide represents new cross-border system of information, management, guidance and knowledge transmission for awareness of the importance of natural, cultural and geological heritage of the cross-border region

FORMATION AND DISTRIBUTION CHARACTERISTICS OF RING-SHAPED “HOT SPRING CHAIN” IN WUGONGSHANASPIRINGGEOPARK, CHINA

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The Wugongshan Geopark is located in the western part of Jiangxi Province, China, with an area of 1470.82 km². In the Wugongshan Geopark, there is a fully developed granite dome with the major NE-SW axis being over 80 km and 2:1 as the axial ration. Having a three-layer structure, the Wugongshan granite dome consists of granite core, detachment fault zone and brittle deformation sedimentary cover. During the evolution of the Wugongshan granite dome, a huge normal fault system was formed. The huge normal fault system communicates with heat sources in the depth, such as magma chambers. Surface water and atmospheric precipitation enter the underground along fractures in the domal core at relatively high altitudes, and after being heated by deep heat sources, return to the surface along the normal fault system at relatively low altitudes to form a ring shaped “hot springchain”. Currently, 16 hot springs were exposed in the granite dome of Wugongshan, including Wentang Hot Spring, Wanlongshan Hot Spring and Wenjia Hot Spring, etc. They are like bright pearls inlaid around the Wugongshan. These hot springs even at the same fault zone are of diverse temperature, water quality and flow, including both selenium-rich hot springs and medical mineral water such as metasilicate water containing radon, lithium and hydrogen sulfide, silicate water, fluorine water, etc. The distribution characteristics of the ring-shaped “hot springs chain” have international significance and have not been reported in the world so far.

HOW TO ESTABLISH A WIN-WIN SITUATION IN COOPERATION– EXPERIENCES BETWEEN JAPAN AND THE IMPACT CRATER LAKE GEOPARK AREA IN FINLAND

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The Impact Crater Lake Geopark has been in operation for almost 7 years now. Right from the start, it was decided that we would aim to learn from other geoparks and hear about their best practices. In addition to the European Geoparks, we were also interested in Japan because we had already established some connections there.

Lake Lappajärvi is Europe's largest meteorite impact crater lake, which was formed 78 million years ago by a meteor impact. An asteroid of about 1 km in diameter collided in an area between Mars and Jupiter and was thrown out of orbit, ultimately hitting the Earth with a velocity of 17 km/s (60,000 km/h). The collision and the vast explosion vaporized the H-chondrite meteorite itself and created a 750 m deep and 22 kms wide crater.

The unique nature of the Impact Crater Lake, the forests, the clean air, the diverse activities, the experiences, and encounters with the local people are the main reasons for tourists to want to spend their holidays in the area known as the Impact Crater Lake Geopark. The aforementioned tourist attractions also attract international visitors.

The basis of the cooperation is the idea that both areas can respect their own heritage and their own ways of doing things. Both partners should be equal, but they would have their own strengths that could be shared with each other. Finnish and Japanese cultures have their own special features, and at first they might seem very different from each other. However, the basic values are the same in both countries; everyone's right to express their opinion, rectitude, honesty, trustworthiness, and loyalty are important.

The goal of the collaboration with a Japanese Geopark is to create structures:

Exportation and importation: the goal is to create at least one twin city agreement with Japan. The agreements will make it easier to create an import/export platform for the regions, which guarantees an increase in regional exports.

Cooperation in student training. Agreements will be created with Japan, which will facilitate the students' migration to the Impact Crater Lake Geopark area, and at a later stage enable their employment and integration into the region.

Utilising the agreements to help promote tourism of the Impact Crater Lake Geopark in Japan.

The first agreement was made with Chichibu Geopark in Saitama Prefecture.

THE FIGHT AGAINST RURAL DECLINE IN WAITAKI

Lisa Heinz, Waitaki Whitestone Geopark

Back in 1998, the rural town of Ngapara lost its school due to rural decline. Farm mechanisation meant fewer farm workers were needed and that meant fewer families with children attending their local school. This sent ripples throughout other rural communities in the Waitaki District and the fear that further rural local schools would close was evident.

In Duntroon, the local residents called a number of meetings to discuss this issue and a number of opportunities were identified to improve the town's assets and fight against rural decline. One of those opportunities was the establishment of a visitor trail and centre that showcased the local geology and marine fossil discoveries. Professor Ewan Fordyce, along with his colleagues and students from the University of Otago's Geology Department, carried out extensive field work in this area in the 1980s and 1990s. They discovered fossil evidence of marine life from around 25 million years ago. Excited by these discoveries, the local farmers were keen to share the story. In 2001 the community formed Vanished World Inc. This led to the establishment of the Vanished World Trail and Centre in and around Duntroon.

Over recent years Professor Ewan Fordyce and the Vanished World Committee have lobbied the wider Waitaki community to consider forming a Geopark and seeking UNESCO accreditation. The Vanished World Centre and Trail were the beginning of what is now the Waitaki Whitestone Geopark. The presentation will provide the example of a community bottom-up approach that enable local development for a rural town and after many years facilitated the establishment of New Zealand's first UNESCO Global Geopark.

LAC SUSTAINABILITY INDICATORS – ASSESSMENT OF EFFECTS OF VISITORS IN LAUHANVUORI - HÄMEENKANGAS UNESCO GLOBAL GEOPARK, FINLAND

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Lauhanvuori - Hämeen kangas UNESCO Global Geopark located in western Finland. The main economic activities have traditionally been agriculture, forestry, commerce, and industry. For example, the area has a long history of utilizing peatlands as agricultural land and for industrial-scale energy peat mining which is currently being run down. Tourism, a relatively young but more and more important industry in the Geopark area, is mainly concentrated around three localities which include most of the geosites, as well: Lauhanvuori and Kauhaneva-Pohjankangas National Parks and Hämeen kangas multi-use area, owned by the Metsähallitus Parks & Wildlife Finland.

From the beginning of the Geopark development of the area the number of visitors has increased by 50 000 visits. Most of the sites were rather unknown, and the visitor numbers were modest. Improved hiking infrastructure and augmented visibility of both the area and the geosites have attracted more and more visitors. The LAC sustainability, biodiversity and geodiversity indicators have been created to assess unwanted effects of visitors in the Geopark area and to measure the carrying capacity of the area. From social and economic point of view, also a few positive effects are monitored. The indicators are set and monitored together with Metsähallitus Parks & Wildlife Finland and the municipalities of the area including several other stakeholders, as well.

In the LAC method only effects of visitors and recreation are assessed. The unwanted effects of visitors e.g., on species occurrences, habitat types, geodiversity, cultural heritage, and on other visitors' experiences are monitored. Also, effects on the local economy and employment are studied. There are both general and area-specific indicators and different data-gathering techniques depending on the indicator: e.g., expert opinions, field surveys, and quantity and quality measurements. Target states and limits of acceptable change of each indicator are set and monitored regularly by a large group of experts on a site-by-site basis.

The risks are related above all to increased number of visitors, disturbance and trampling, recreational erosion, littering, and breaking rules. Off-trail activities occur while photographing for social media, off-road biking and in mass events. As an example, dogs are left unleashed, and visitors trespass in restricted areas, set illegal campfires and drive all-terrain vehicles without a permit. If the limits of acceptable change are exceeded, actions are taken, e.g., duckboards, fences, or stairs are built to guide visitors and to protect the geodiversity and biodiversity and other values of the site. In the Lauhanvuori – Hämeen kangas Geopark area, new indicators have been set recently, and the first assessments are available. Assessment scale from 1 to 5 is used. Number five indicates that there are no signs of weakening in values of a site, species, or habitat etc., number one indicates that the values are lost. The time span of the follow-up measures for different indicators varies. The results are evaluated, and the possible actions are designed together once a year.

**UNESCO GLOBAL GEOPARK KÜTRALKURA – CHILE
NATURAL LABORATORY, OPEN CLASSROOM AND LIVING TERRITORY,
STRATEGIES FOR GEOEDUCATION
EDUCATIONAL MATERIAL**

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1.- Program "Innovation and Technology

Transfer for the Ecosystem of Entrepreneurship of the UNESCO Kütralkura Global Geopark", executed by the University Mayor in coordination with the Association of Cordilleran Municipalities of La Araucanía entity in charge of the Geopark and financed by the Regional Government of Araucanía, consider one of your specific goals to develop a digital educational resource pack interactive and physical that support permanent training and education programs in conservation and geotourism, both for tourism entrepreneurs and high school students technicians specialized in tourism and basic schools in the area, according to the plans and programs of the Ministry of Education (MINEDUC) as part of the Strategic Plan of the Geopark that seeks to strengthen educational strategies.

2.- Training courses

2.1 Diploma for key stakeholders in the Geopark (guides, operators and local development agents)

2.2 Open course to the community: Geoparque natural laboratory, open classroom, living territory

3.-Meetings of Knowledge educational outings

2. CHALLENGES:

1.-Inclusion of priority content in formal education plans in geopark schools (climate change, risk and disaster management, geodiversity, ancestral knowledge, etc.).

2.- Preparation and publication of a volcanological exploration guide focused on bringing science, especially volcanology, closer to girls and young people living in areas exposed to volcanic hazards in the Araucania Region in order to increase their resilience and response capacity against future volcanic eruptions in area.

3.- To continue the program of visits and work with the Vulcanological Observatory of Los Andes del Sur of Sernageomin.

GGN CONTRIBUTION TO THE IUGS GEOLOGICAL HERITAGE SITE PROGRAMME

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Abstract

The International Union of Geological Sciences (IUGS) and the Global Geoparks network (GGN) have a long tradition of collaboration since 2004, which has been recently reinforced. In 2022, the IUGS reactivated a long-demanded programme of recognition of Geological Heritage Sites of the highest scientific value. An IUGS Geological Heritage Site is a key place with extraordinary geological elements or processes of the highest scientific international relevance, used as a global reference, and/or with a substantial contribution to the development of geological sciences through history.

During the IUGS 60th anniversary event, celebrated in the Basque Coast UNESCO Global Geopark, the First 100 IUGS Geological Heritage sites were announced. This global endeavour has been activated with the important support of the IGCP-731 project and has been achieved thanks to the close collaboration of international experts from more than 50 countries and 16 major international organizations that represent all different disciplines of geological sciences.

The role of the GGN as a global organization related to geological heritage with institutional members, 195 UNESCO Global Geoparks in 48 nations, has been especially important to contribute to the initial network of international experts. UNESCO Global Geoparks are extraordinary tools for local development based on geological heritage of international significance.

Not all geoparks are expected to have sites with such global iconic scientific value required by the IUGS recognition, but many geoparks do have extraordinary geological sites that can get this recognition. 29 geological sites from 29 Geoparks were presented and 16 were included in the list of the First 100. Iconic sites for geological sciences like the Moine Thrust (NW High Highlands UGGp), Zumaia stratigraphic section (Basque Coast UGGp), Lesvos petrified forest (Lesvos UGGp), Genbudo cave (San'in Kaigan UGGp), Bilitumegadunes and Lakes (Alxa desert UGGp), Laetoli Olduvai paleoanthropological site (Ngorongoro Lengai UGGp), or the Cotacachi – Cuicocha volcanic complex (Imbrabura UGGp) are only some of the significant geological heritage sites hosted in UNESCO Global Geopark.

More than 20 candidate sites from UNESCO Global Geoparks like Troodosophiolite (Troodos UGGp) or Colca canyon (Colca y Volcanes de Andagua UGGp) will be considered for the Second 100, which will be announced during the International Geological Congress 2024 in Busan.

Through this collaboration, the IUGS and GGN reinforce their close partnership to promote the visibility of the great geological heritage contained in many UNESCO Global Geoparks around the world.

UNIVERSITY EDUCATION IN UNESCO GLOBAL GEOPARKS – A GERMAN PERSPECTIVE

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Currently there are eight UGGps in Germany. They cover close to 10% of the land area of Germany and are regarded as model regions for sustainable development. Some of the geoparks are characterised by a variety of rocks, spanning hundreds of millions of years (e.g. UGGps Bergstraße-Odenwald, Harz-Braunschweiger Land-Ostfalen, TERRA.Vita, Thuringia-Indselsberg – Drei Gleichen) while the others (Muskauer Faltenbogen/Łuk Mużakowa, Swabian Alb, Ries and Vulkaneifel) have an individual focus on geological periods and processes.

All geoparks have a very well-developed infrastructure in terms of accommodation as well as access to geological points of interest. All are equipped with various forms of information centres. Typically, geological hiking trails or cycling routes are signposted. Various scientific collaborations exist with universities in Germany and abroad.

University education in geoscience and related subjects is always based on practical fieldwork and fieldtrips. In the last decades it became very popular to run such field classes abroad. The reasons are manifold, but besides others related to the fact that air travel became very cheap. However, the younger generation of students expects their education to be more sustainable. Here, the geoparks can play a fundamental role. Starting from zero emission transport (train, hiking, biking) to regional food, the geoparks offer platforms for sustainable field education. University teachers will find it very easy to run such trips in geoparks as the relevant points of interest (e.g. geotopes) are well documented and well maintained.

Various other benefits are associated with student trips into geoparks. Often, younger people are technophile. This offers to open cooperation-strategies in terms of digitization. Here, we already see the development of smartphone apps and 3D-models of geo-objects.

In conclusion: Geoparks offer the opportunity to run sustainable field classes and can benefit from inspiring ideas of the next generation.

RESEARCH-STUDY-TOURS PRACTICED IN ZHANGJIAJIE UNESCO GLOBAL GEOPARK OF CHINA

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Zhangjiajie UNESCO Global Geopark (UGGp) is located in the western Hunan Province of China, with landscapes characterized mainly by more than 3000 sheer vertical sandstone pillars, peaks and walls of 30-350 m high. These spectacular features have made it a UNESCO natural heritage site in 1992, a member of Global Geopark Network in 2004. However, the landscapes were made well known to the public only in early 1980, because the geopark is located in the mountainous area of the western Hunan Province of China and was very difficult to access before. In recent years, the transport systems to the geopark have been enhanced significantly, and the access to the geopark has become much easier. In addition, the Chinese government has incorporated Research and Study education into the curriculum of primary and secondary schools recently, strengthened the establishment of Research-Study-Tours bases, and standardized the organization and management of Research-Study-Tours. With the continuous deepening of national education policies, Research-Study-Tours have become one of the important means to cultivate students' scientific literacy and improve their innovative capabilities.

In March, 2023, Zhangjiajie UGGp launched the Research-Study-Tours season and unveiled Research-Study-Tours products worldwide. The products are built upon the geological landscape, ecological environment, and folk culture in Zhangjiajie UGGp. Mainly in the form of routes, the products cover the two main areas of natural science popularization and cultural heritage, encompassing three modules (geological investigation, forest investigation, and Zhangjiajie history), seven themes, such as archaeology and geological exploration, and 15 practical topics including investigations of quartz sandstone and landscapes. Since the launch of this Research-Study-Tours season, primary and secondary school students in the province have frequently come to conduct Research-Study-Tours in Zhangjiajie UGGp, and a large number of students outside the province have also been attracted to conduct the activities. Particularly on April 17 and 25, 528 students from Sanxin School in Zhongshan City, Guangdong Province, took two special research and study trains from Guangzhou to Zhangjiajie UGGp and embarked on a 5-day "Zhangjiajie Landscape" Research-Study-Tours. The successful organization of these interprovincial Research-Study-Tours activities marks a new milestone in the expansion of the activities in Zhangjiajie UGGp beyond Hunan Province and this presentation will provide a detailed introduction of the achievement and the difficulties encountered.

LUSHAN UGGP'S ABSTRACTS FOR ORAL PRESENTATION AT THE 10TH INTERNATIONAL CONFERENCE ON UNESCO GLOBAL GEOPARKS

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Lushan UNESCO Global Geopark is located in the northern part of Jiangxi Province, with the Yangtze River, the longest river in China, to her north and the Poyang Lake, the biggest fresh water lake in China, to her east. It covers an area of 548 km². She is the first Chinese world heritage cultural landscape in the UNESCO World Heritage list in 1996, and was inscribed as one of the first members of Global Geopark Network in 2004.

Since joining the big family of Global Geoparks Network, Lushan UGGp have set up twin geoparks relationship with Bergstrasse-Odenwald UGGp, Germany, Novohrad-Nógrád UGGp, Hungary and Slovakia, Marble Arch Caves UGGp, Ireland & UK, Styrian Eisenwurzen UGGp, Austria Lesvos Island UGGp , Greece of European Geoparks Network, Araripe UGGp, Brazil of Latin American and Caribbean Geopark Network, Rinjani Lombok UGGp, Batur UGGp , Indonesia, Huangshan UGGp, Sanqingshan UGGp, Zhijindong Cave UGGp, Zhangjiajie UGGp, Shennongjia UGGP, Jiuhuashan UGGp, Zhangye UGGp, Dali-Cangshan UGGp, Yimengshan UGGp, Wudalianchi UGGp, Wugongshan a UGGp of Asia Pacific Geoparks Network.

We twin geoparks sent delegations led by geopark leaders to enhance cooperation and communication to each other, conducted scientist and manager team cooperation project to study each other's best practice in geopark conservation and management, conducted cultural and arts exchange projects, organized special exhibitions for each other, and made cooperating publicity in international UGGps Conference, and especially overcame the difficulties of the epidemic and organized various online and offline events of geopark education and popularization so as to promote the mutual communication and cooperation. With our jointly efforts, we are enhancing the win-win development of geoparks and the progress of Global Geoparks Network.

**SCIENTIFIC RESEARCH AND SCIENCE POPULARIZATION BASED ON THE GEODIVERSITY OF
TIANZHUSHAN UNESCO GLOBAL GEOPARK**

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Tianzhushan UNESCO Global Geopark is located in the eastern part of Dabieshan Orogenic Belt between North China Plate and South China Plate and the southern part of Tancheng-Lujiang Fault Zone. It is currently internationally recognized as an important area of ultrahigh pressure metamorphic belt, because of its largest scale, deepest denudation, best exposure and most abundant ultrahigh pressure minerals and rock combinations in the world, such as coesite-bearing eclogite, diamond-bearing eclogite, jadeite quartzite, gneiss, garnet peridotite and marble, recording the amazing geological process of the collision, subduction and reversion of continental plates, therefore, the Tianzhushan area is one of the most typical areas for the studies of continental dynamics; besides, Tianzhushan Geopark is world-famous for its most beautiful granite landform in the Tancheng-Lujiang Fault Zone, in particular the cave landscape formed by landslides and collapsed stack of granite has been named as a landscape with the "Tianzhushan type" collapsed and stacked stones; in addition, more than 60 species of vertebrate fossils have been discovered in more than 40 sites within Tianzhushan Geopark, with Asian endemic characteristics, which makes Tianzhushan have a unique position in research of the evolution of Paleocene mammals, and be recognized as "one of the birthplaces of Asian mammals and a treasure land of paleontological vertebrate fossils".

In recent years, there are three newly discovered geoheritages in Tianzhushan UGGp, including tourmaline-bearing eclogite and two fossils: *Qianshanosuchus youngi* and *Shixingoolithus qianshanensis*. Scientific research and science popularization are mutually dependent and promote each other. Tianzhushan Geopark actively uses scientific research results as the foundation for science popularization and promotes the deep integration of science popularization and scientific research.

Based on the geodiversity, Tianzhushan UGGp has made great efforts to disseminate knowledge of geosciences. Firstly, kinds of rocks and fossils are displayed in Tianzhushan Geopark Museum, which also displays local rich natural and cultural resources; Secondly, a popular science reading *The Qianshan Fauna* is edited and several short videos and micro-films are shot to introduce the abundant fossils and rocks in Tianzhushan UGGp; Thirdly, Tianzhushan UGGp actively supports universities and scientific research institutions to conduct scientific research in the geopark, and at the same time, creates a platform for scientific communication, which plays an important role in improving the quality of public science education; Fourthly, colorful science popularization activities are carried out with local schools, including lectures, field practices, interpretation competition, drawing competition, geopark museum visits and other interactive activities.

KOREAN EFFORTS FOR DEVELOPING THE ASIA-PACIFIC GLOBAL GEOPARKS: FOCUSING ON THE ESTABLISHMENT OF GLOBAL GEOPARK ASIA PLATFORM CENTER(TENTATIVE) AND MUDEUNG SAN UGGP

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In order to improve the recognition of the geopark and educate for concerns of Asia-Pacific geoparks, the Central Government of the Republic of Korea and Gwangju Metropolitan City in Mudeungsan UGGp are establishing the "UNESCO Global Geopark Asia Platform Center (tentative)." The total investment cost estimates a 2.8 billion US dollars (36.7 billion Korean Won). The building was planned in 2017 and secured by the government in October 2020. The detailed design project was started in 2021. The expected opening time of the building may be at the end of 2025.

The platform center will be occupied by the two organizations (the office of Korean Geoparks Network and Mudeungsan UGGp Foundation (Education and Research Center)) and displayed in a Public Exhibition Hall on Asia-Pacific Geoparks. The main role of the center is as follows:

Education and International Exchange Field including professional education and training;

Research and Monitoring Field focusing on geological, paleontological (especially dinosaurs), and ecological research;

Exhibition and Experience Field of Asia-Pacific Global Geoparks and Mudeungsan UNESCO Global Geopark;

Management and Resources Field based on geopark use and administrative supporting.

The establishment of the UNESCO Global Geopark Asia Platform Center is to be caused by the long-time maintained civil spirit. Before and after certification as UNESCO Global Geopark of Mudeungsan, citizen movements for the preservation and conservation of the Mudeungsan (Mudeung Mountain) were very active. In 1972, the Mudeungsan was designated as a provincial park of Jeollanam-do Province, and the area was one of the most popular vacation destinations in South Korea during the 1980s. The two districts (Jeungsimsa and Wonhyosa Temple districts) at the entrance of Mudeungsan were crowded with many recklessly established restaurants and lodgings.

Such densely located housing facilities emitted wastewater and caused serious natural damage. In this situation, the movements of the local government and citizens who preserved Mudeungsan displayed a new moving project from 2003. In 2010, all restaurants and lodgings in the Jeungsimsa Temple district were moved to the new area in the lower part of Mudeungsan. The native people in the Wonhyosa Temple district are also working to relocate to the other place (Chunghyo-dong Cultural Village) in the lower part of Mudeungsan from 2016 to now. The military (air-force) base located at the summit of Mudeungsan in 1966 has progressed the relocation project.

We are planning a new project in which the air-force base will be returned for visitors to the Mudeungsan Global Geopark. The big-sized Shinyang Park Tourist Hotel set up in 1981 was also returned to citizens by the national trust movement. We know we need more efforts for the preservation of Mudeungsan UGGp.

INITIATIVES TO DEVELOP NATURE TOURISM BUSINESSES IN PLATÅBERGENSUGGP, SWEDEN

Sofia Hultman, Anna Bergengren

Platåbergens Geopark was designated as Sweden's first UNESCO Global Geopark in 2022. The geopark is located between Sweden's two largest lakes, Lake Vänern and Lake Vättern, and the area consists simply of the Västgöta Plain and the fifteen table mountains that surround it. The geopark covers an area of 3690 km² and nine municipalities: Grästorp, Vänersborg, Trollhättan, Lidköping, Götene, Mariestad, Skövde, Skara, and Falköping.

Since 2020, we have received support from the The Swedish Agency for Economic and Regional Growth to work on increasing attractiveness and developing a sustainable tourism industry in the table mountain landscape. The funding is part of an effort to contribute to a sustainable transition in the aftermath of the COVID-19 pandemic, and the granted funds are EU funds from the national regional fund program.

Within the project, we have identified that a key factor in developing nature tourism in our area is to strengthen nature tourism companies that can host guests and provide them with sustainable, local, and authentic experiences.

To succeed in this, we have built a digital training platform for guides, where they can acquire in-depth knowledge ranging from hospitality and guiding techniques to specialized knowledge about the area's geology. On the digital platform, guide companies can download texts, images, and illustrations that they can use for their marketing purposes. We have also published a handbook with quick facts about the geopark and its geology, which can be easily used by guides.

We have also developed various concepts that guides can use to sell and package their products. These include "Food and Experience Walks" and "Coffee Walks." The common feature of these concepts is that they always combine food, physical activity, and knowledge.

Additionally, there are initiatives to promote collaboration and networking among nature tourism companies within the geopark. By fostering connections and cooperation, companies can share knowledge, best practices, and jointly develop innovative products and packages. This collaborative approach helps create a cohesive and attractive tourism offering in the area.

TITLE: UNIQUE FEATURES OF THE WORKSHIPPING OF MOTHER GODDESSES OF THE THREE REALMS IN LANG SON GEOPARK

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Lang Son Geopark is located in the northeast of Viet Nam, about 154 km from Hanoi capital, mainly in the limestone mountains with an average altitude of 400 meters to 500 meters, with an area of 4,736 km², a population of 621,260 people, accounting for 57% of the area and 77.4% of the population of Lang Son province. Geology is mainly composed of sedimentary rocks - Phanerozoic eruptions, deep fault traces operating in a block pattern forming Na Duong, Lang Son, Bac Son basins or the Mau Son uplift. Most of the ancient fossils date from 400 million years to 4,000 years ago, the most typical is the Na Duong sedimentary basin that has discovered a series of mammal fossils that first appeared on Earth.

In addition to the geological values, this area is also more prominent by the Mother Goddess Worship in the residential community, which is a form of mother goddess worship, formed on the basis of the Goddess worship belief. It is a little different from the belief of worshipping the goddess Gaia of Greek mythology (only worshipping the original "mother earth" that gave birth to all things). Mother Goddess worshipping worships three mothers representing Heaven, Mountains and Rivers, which are called Mother Goddesses of the three Realms. People worship the Holy Mothers who govern the three regions in combination with worshipping historical or legendary figures who have contributed to the country and the people.

The type of the worshipping of Mother Goddesses of the three Realms in Vietnam was recognized by UNESCO as an Intangible Cultural Heritage of Humanity in 2016 during the 11th Conference in Adis Abeba, Ethiopia. In Lang Son, the practice system of worshipping Mother Goddesses of the three Realms is everywhere, most notably Bac Le Temple, Dong Dang Mother Goddess Temple, Chau Nam Temple, Ky Cung Temple and Cua Dong Temple. Subjects of worship are diverse but unified, with the top of being the three Mother Goddesses representing Heaven, Mountains and Rivers, then other lower worshipping systems such as the Five Great Mandarins, 10 Female Adorating Mandarins, 10 Male Adorating Mandarins, Girls and Boys and so on.

The worshipping of Mother Goddesses of the three Realms has outstanding value in ceremonies, the most famous being the Hau Dong ritual, Chau Van singing and performing arts creating a unique and attractive spiritual cultural space. This is a strong highlight that attracts a lot of people and tourists to participate in religious practice facilities. In addition to the cultural and spiritual meaning, this activity also contributes to upholding the role and values of women in family and social life, expressing patriotic traditions and gratitude to those who have contributed to the community. This activity has a sustainable vitality, spreading strongly in community life, an important highlight to promote sustainable socio-economic development associated with preserving the geological value of Lang Son Geopark. These typical values are the motivation to build Lang Son Geopark towards achieving the goal of the title of a UNESCO Global Geopark in the future.

TORATAU ASPIRING UNESCO GLOBALGEO PARK

Aikraova Alia, .Pole of sustainable development in the center of Eurasia

The aspiring UNESCO Global Geopark "Toratau" is located at the junction of the southern part of the Ural Mountains and the eastern outskirts of the East European Platform, in the center of the Republic of Bashkortostan. The territory is rich in unique geological objects. They are of scientific, historical and natural value.

Bashkir shikhans are Permian fossil reefs, which are world—famous unique geological objects. The formation of shikhans began about three hundred million years ago, when there was a sea on the territory of modern Bashkortostan. These paleorifs were formed by various organisms: bacteria, foraminifera, mosses, brachiopods, corals, and so on.

On the territory of the Toratau Geopark there are two geological objects of international importance in Russia recognized by the International Commission on Stratigraphy - the Usolka section (GSSP) and the Dalny Tulkas section (GSSP).

One of the most important implemented projects of the geopark is the ecotrail on Toratau. Around the shikhan a tourist navigation system and a visitor center provide tourists with a detailed information, including the trajectory recommended for safe ascent. An equipped ecotrail-ladder allowed to streamline the movement of tourists on the ascent and descent. And we hope it will contribute to the restoration and preservation of the flora and fauna of shikhan Toratau. For the convenience of guests, the staircase is equipped with recreation areas and information stands about biology, geology and history of Toratau in 3 languages - Russian, English and Bashkir.

Since 2020, scientific research on local manifestations of global climate change has been conducted in the Toratau Geopark in cooperation with the Ufa University of Science and Technology. On the territory of the geopark, platforms were laid for monitoring changes in soil temperature and humidity using data loggers. Based on the results obtained, the verification of the Earth remote sensing data (Landsat) was carried out, the relationship between the state of vegetation and the temperature regime was assessed, and the areas for which the threats from climate change are the highest were identified. Research on monitoring the temperature and humidity regime in the territory of the geopark will be continued in the future.

Educational activities in the geopark include lectures for local schoolchildren on ornithology, entomology, paleontology, climate change. Together with the Institute of Geology of the UFIC RAS and the UNESCO Global Geopark Yangan-Tau, regional competitions for children are held annually - "The World of Paleontology", "The World of karst and Caves". On the territory of the geopark, young geologists write research papers, and a field camp is also organized for them every year.

Our geo guides (all of them are locals) conduct excursions for guests of the Toratau Geopark, including excursions for children with disabilities, organized in partnership with the Committee of the Republic of Bashkortostan for UNESCO. Geo guides tell about the natural, geological, cultural and historical heritage of the geopark. (For example, over the last year geo guides have conducted excursions for more than 8700 people.)

Toratau Geopark has released the first scientific comic book for children in Russian and English and didactic materials for classes.

All more detailed information about the geopark can be found on our website.

BRIDGING GEOTOURISM AND DARK TOURISM

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Conventional geotourism has focused on natural science perspectives, such as topography, and has focused on enjoying the magnificence. However, dark tourism, which appeared in the field of tourism studies at the end of the 20th century, may give new and different values to geotourism. This report explores the relationship between geotourism and dark tourism, which is often described as a journey through the memory of a tragedy. Though dark tourism deals with various objects, this report discusses the relationship between typical dark tourism areas and geotourism.

Natural disasters are perhaps the most suitable subjects for considering the relationship between dark tourism and geotourism. For earthquakes in particular, considering the topography created by them and the damage they caused simultaneously enables us to think about disasters from a bird's-eye view. Especially in Japan, as disaster prevention learning is expected in geopark activities, the demand for geotourism looks high. Moreover, in the case of Japan, it is possible to deeply consider the relationship between volcanic disasters and hot springs. Japan is known for its many hot springs, and the background behind the birth of these hot springs is volcanic activity. Volcanoes provide both disasters and blessings in the form of hot springs. Geotourism views volcanoes in terms of blessings, while dark tourism considers volcanoes in terms of disasters, so that the same place can be analyzed from multiple perspectives. At first glance, the war may seem irrelevant to Geopark's activities. However, there are many historical facts in which the terrain was related to the results of the battle. For example, in the Battle of Highland 203 during the Russo-Japanese War, obtaining the highland was an important goal, and the unique topography of this area was directly linked to the tactics. As geography has initially been treated as part of military knowledge in modern times, geotourism related to war can be developed and coexist with dark tourism, which deals with the grief of the war dead and the view of sorrow in ruined cities.

The perspective of geotourism is also compelling for industrial heritage. Mining resources, such as coal, gold, and diamond mines, are explained by geological mechanisms. On the other hand, the actual utilization was done from an economic point of view and historically was closely linked to colonial exploitation. The reality of mining operations in the colonies is the thing with which dark tourism deals. In making mines a subject of study, combining the geological perspective of geotourism with the sociological perspective of dark tourism makes study tours to mines more effective.

In this way, dark tourism and geotourism can be functionally combined. In future tourism development, it will be possible to develop tourism in a new era by utilizing both viewpoints.

**HOW SYNERGIZING MULTI INTERNATIONALLY DESIGNATED AREAS? : CHALLENGES AND
POSSIBILITIES OF HAKUSAN REGION FOR SUSTAINABLE DEVELOPMENT OF MOUNTAIN REGION**

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The mountainous area of Hakusan Todorigawa UNESCO Global Geopark is newly multi designated with Mount Hakusan Biosphere Reserve. There are challenges and possibilities for the implementation of both UNESCO science programs simultaneously at the ground level among integrative governance, mountain and ecosystem management, conservation of forest ecosystem services, geological tourism, disaster prevention and climate change. Educational activities conducted under the collaboration with local NPOs and universities which can contribute to integrate these issues on sustainable development of mountain region in multi internationally designated areas will be introduced.

ANALYSIS OF THE TOURIST CARRYING CAPACITY OF THE PIRUVA CANYON, IN THE QUARTA COLÔNIA GEOPARK – BRAZIL

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Universidade Federal de Santa Maria.

This study examines the phenomenon of the significant increase in visitors to the Piruva Canyon, a natural area of great scenic beauty in the Quarta Colônia Geopark, southern Brazil. It is observed that this influx of visitors is, in large part, the result of the activities of local and regional tourism agencies.

The objective of this study is to analyze the impact of these visits on the environment and discuss the implications for municipal public management in planning sustainable development based on ecotourism and conservation of biodiversity. To this end, Cifuentes' (1991) calculation of the Tourist Carrying Capacity (CCT) was used as a methodology, which defines the carrying capacity as based on the survey of the physical and biological parameters of the areas. In an integrated manner, the normative approach of the Visitor Impact Management VIM (1990) was adopted to carry out the behavioural analysis of visitors.

Thus, as a result of the calculation of the CCT of the Piruva Canyon, the maximum number of 205 visitors per day was obtained. In turn, from the behavioural observation of the participants and based on the answers to the questionnaires by the VIM, most tourists do not attach importance to nature conservation, and perceive the Piruva Canyon only as a leisure utility, presenting an impactful behaviour in the local.

In this perspective, it is necessary to carry out a visitation management that includes environmental awareness and education measures before having access to natural areas such as the Piruva Canyon, adequate to the number of visitors calculated by the CCT.

THE ROLE OF NGO IN SUPPORTING STRENGTHENING THE ROLE OF FARMERS IN MERANGIN JAMBI GEOPARK TO SUPPORT SUSTAINABLE COFFEE CULTIVATION

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Simpang Talang Tembaga Village is administratively located in East Jangkat District, Merangin Regency, Jambi Province. Simpang Talang Tembaga is one of the villages included in the main area in the Merangin Jambi National Geopark which has the potential to be developed into a smallholder plantation center with coffee as one of its superior products. The initiation of the development of coffee business production in this village was carried out by the Bunda Sitingau Alam Women Farmers Group which was assisted by the local NGO Lembaga Tiga Beradik (LTB) since 2016. The coffee processed by this group has been recognized for its quality and received an award as Indonesia's best robusta coffee from SCAI - Specialty Association Coffee Indonesia.

Keywords: coffee, sustainable, geopark, NGO

Background of the Study

Before the assistance was carried out by the Tiga Beradik Institute, the community tended to farm with a shifting cultivation system, which had the potential to open up forest areas given the limited area of the plantation area. Through the sustainable coffee cultivation system, slowly, the community began to change the planting pattern and accommodate the managerial system in record-based financial management. The first step taken by LTB was to hold a Field School for the community which lasted three months. The community was very enthusiastic in following and learning the coffee cultivation knowledge delivered, both in class and practice in the garden. After the Field School, they practiced the knowledge they got. In the mentoring process, LTB and the farmer groups also learned about the existence of connoisseurs and markets for quality robusta coffee in Indonesia. This information is important because it has an impact on the motivation of the group.

Analysis

Collaborative work in developing the coffee business is also carried out, where women take a role in preparing the garden to the post-harvest process. In addition, through the container of the Women Farmers Group (KWT) for the role of producing coffee after post-harvest to become powder ready for sale. Meanwhile, producing Fine Robusta (greenbean) is done by farmer groups consisting of men. Here, NGO plays an active role in providing knowledge to the farmer groups to be able to process robusta coffee beans properly, so that only red cherry is picked and selected for processing. NGO also assisted in initiating branding to market and promote the coffee to various places, including bringing coffee production to compete at the national level. A valuable opportunity came when D'jangkat Sungai Tenang robusta coffee participated in a coffee auction held by the Specialty Coffee Association of Indonesia (SCAI) Bali in August 2018. In this activity, participants are required to send a 2-kilogram sample of coffee beans to SCAI in August for taste testing in September. After passing the taste test and being scored by coffee judges, the selected coffee beans that passed the taste test were auctioned in October 2018. In this activity, participants are required to send a 2-kilogram sample of coffee beans to SCAI in August for taste testing in September. After passing the taste test and being scored by the coffee jury, the selected coffee beans that passed the taste test were auctioned in October 2018. In this auction activity, D'jangkat Sungai Tenang Robusta Coffee received an auction value of IDR 300,000/kilogram, and became the most expensive robusta coffee in the history of the robusta coffee world. This result made our assisted farmer group proud because their hard work for two years really paid off. Consecutively, they have managed to maintain this achievement until now.

Conclusion

Some of the keys to success of this mentoring process include:

- Motivation to keep learning
- Desire to practice what he learned
- Continuously seeking the latest information related to coffee trends
- Knowledge of growing coffee sustainably
- Keeping good management records
- Gender equity

From the above, the community finally has the ability to be maintained and developed in order to achieve sustainable coffee cultivation.

This can be seen from :

- Able to sort coffee beans 1.
- Identifying natural resources owned 2.
- Conducting training related to good agriculture for robusta coffee 3.
- Practicing knowledge from training to the farm 4.
- Finding out the development of robusta coffee in Indonesia 5.
- Learning to create fine robusta coffee together 6. Making innovations in managing robusta coffee beans 7.
- Participate in a national competition of fine robusta coffee 8.
- Create and promote a brand of fine robusta coffee produced 9.
- Market the product to coffee lovers both domestically and internationally 9.

In general, it can be concluded that both women's and men's farmer groups in Simpang Talang Tembaga Village have been successful in producing high-quality robusta coffee beans, controlling product selling prices, managing their coffee farms sustainably and earning higher incomes, and most importantly, reducing the clearing of new fields in forest areas

**SPERMONDE ARCHIPELAGO WITH A CLUSTER OF CORAL ISLANDS, AND
AN UNDERWATER PARADISE EAST THE MARITIME SOCIETY OF MAROS PANGKEP UNESCO
GLOBAL GEOPARK (MPUGGP)**

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Management Body of Maros Pangkep UNESCO Global Geopark

Maros Pangkep UNESCO Global Geopark is located in Maros and Pangkep Regencies, South Sulawesi Province, consisting of 44.6% land and 55.4% water. On the marine side, the area mostly includes the Kapoposang Water Tourism Park and the Liukang Tupabbiring Local Marine Conservation in the ocean. Coral Reef Island of Spermonde Archipelago, each of which has a significant geological heritage, reflecting the combination of terrestrial and marine features which are interrelated with each other into a single landscape territory. There is extensive exposure to modern carbonate platform of Spermonde Archipelago were locally built hundreds of patch reefs, on top of which are covered by sandy marine sediments that demonstrates the morphology that can change throughout the monsoon by the geodynamic process of the Indonesian Throughflow (ITF) ocean currents. These reef islands, which are part of the global coral triangle represent modern equatorial carbonates and complement the evolution of Sulawesi paleogeography. The Spermonde, in geopark area consists of 39 islands, with some of them are vegetated and inhabited while the others are sand dunes. The farthest island is on Kapoposang Island (\pm 40 miles from the coastline). As an archipelagic landscape, this area also contains a diversity of marine life because it is also in the Coral Triangle waters and serves as a center for the conservation of coral reef ecosystems with high-quality scientific objects.

**CULTURAL HERITAGE MANAGEMENT PLAN DOCUMENT, AS A CONSERVATION
WAYTOHANDLINGTHEOLDESTROCKARTCAVEPAINTINGOFFAHUNTINGSCENEINTHEMININGCONCES
SIONAREAN MAROS PANGKEP UNESCO GLOBAL GEOPARK (MPUGGP)**

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MarosPangkep UNESCO Global GeoparkislocatedinMarosandPangkep Regencies, South Sulawesi Province , in The terrestrial section displays the tower karst landscape known as "The Spectacular Towers Karst". There are 572 of horizontal and vertical caves with complete speleothem characteristics and the longest cave in the area (27 km) as the hydrological system of the karst area, an underground river connected to the doline as the cave entrance. To date, at least 332 types of prehistoric findings have been collected for all locations, such as wall paintings, stone artifacts, mollusk shells, bones, and pottery distributed in caves. The oldest findings to date are in Bulu Sipong 4 Cave in the Geosite Bulu Sipong, Tonasa Natural Park, which is a rock art cave painting of a hunting scene that is 43,900 years ago, and a 45,500 years old pig painting as an old animal art located in Leang Tedongnge. The high potential of archaeological heritage makes the Maros Pangkep Geopark area unique as an object of research, student education, and prehistoric tourism. In supporting the preservation of natural resources and cultural heritage, Maros Pangkep Geopark creates a project guidelines in handling cultural heritage, including aspects of protection, development, and utilization which is called the Heritage Management Plan. Industries engaged in mining in Maros Pangkep Geopark areas are required to increase their responsibility in real efforts to manage cultural heritage and to protect the hydrological system with a preservation perspective, in the concession area and its surroundings. In line with the demands of mining companies to apply the concept of green mining, a cultural heritage management plan is needed.

As for the scope of the study, namely providing consultation or assistance and preparing a cultural heritage management plan with the following stages, Desk Study and Focus Group Discussion with industrial management and the area community (before and after field data collection), Archaeological observation and survey in mining concession areas, data processing and preparation of archaeological potential study reports and cultural heritage management plan documents with standard procedure finding discoveries follow up with monitoring. An effective cultural heritage management can create mutual wide economic, social, and environmental benefits.

GEOLOGICAL HAZARDS AND SAFETY ASPECTS OF TWO NATIONAL GEOPARKS IN MALAYSIA

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Malaysia has one (1) UNESCO Global Geopark, six (6) National Geoparks and several other Aspiring Geoparks. This paper will discuss two of the National Geoparks, namely Jerai National Geopark located in the state of Kedah and Kinta Valley National Geopark located in the state of Perak. Jerai National Geopark has 24 geosites, 2 biosites and 6 archeological and cultural sites while Kinta Valley have 17 geosites, 8 biosites and 10 archaeological and cultural sites. The main features of Kinta Valley National Geopark are karstic landscape with mining and quarrying as major economic activities, then and now.

Kinta Valley National Geopark has 45 limestone hills and almost 200 caves. Major geological hazards are landslide (mainly rock fall), subsidence (mainly sinkhole) and cave stability. The Department of Mineral and Geoscience Malaysia has published Guideline on Demarcation of Safety Zones in the Vicinity of Limestone Hills in 2013. Safety of limestone cliffs are paramount important as several landslides and rockfall cases in the past has killed people and destroyed houses and other properties. Jerai Geopark experienced large-scale multiple debris flow on 20 August 2021 where four (4) people killed and two (2) are still missing. Major attraction area including chalets were destroyed completely and most part downstream covered with debris flood and/or mud flood. This paper will present the works carried out at both national geoparks including the geological hazards mapping, characterization, analysis and modelling. Post-disaster and disaster preparedness activities including installation of Early Warning System (EWS) Community-Based Disaster Risk Management (CBDRM) will also be presented.

GEPARK PROJECTS IN AUSTRALIA

Patrick James & Ross Dowling

Australian Geoparks Network

Australia has a comprehensive inventory of geoheritage as well as numerous recognised national geological and landscape assets. It has extensive and sophisticated geoscience education and training as well as a well developed nature-based tourism industry. Australia is currently developing a comprehensive *National Geotourism Strategy* whose goals include defining an approval pathway for major geotourism projects, establishing geotrails, enhancing geoscience interpretation, and fostering international links. Many organisations within every state are developing geotrails; geoheritage registers; special interest geotourism around former mines; and communication and education strategies. So much is happening in this sphere.



Remarkable Rocks, South Australia; London Bridge, Western Australia; Uluru, Northern Territory

Missing from the above is geopark development, despite the country being an early adopter of them. In 2008 at the *3rd International UNESCO Conference of Geoparks* held in Osnabrueck, Germany, Australia's Kanawinka Geopark was designated the 57th Global Geopark, the first in Australasia or the Pacific. The Geopark designation only lasted for four years and in 2012 the Australian Government did not seek its re-validation. Today Australia is the only continent which has no UNESCO Global Geoparks.

However, with the rapid growth of geoparks around the world, there is widespread interest in Australia re-joining the Geopark movement. In 2018 Geoparks Western Australia (GWA) was established and in 2021 the Australian Geoparks Network (AGN) was formalised (<https://australiangeoparksnetwork.org>). The AGN has representatives from every state in Australia as well as an International Advisory Board comprising a number of key Geopark Leaders from around the world. The AGN is now working to establish geoparks in Australia through geotourism and geotrail development. These developments are working to allay concerns about geopark development from geological surveys, mining companies, pastoralists, and a range of government agencies. Thus the AGN and GWA is gaining traction and in Western Australia there are now four regions actively working to establish geoparks. They are the Murchison GeoRegion & Aspiring Geopark, Nannup Geopark, Binjareb-Peel Geopark and the Wanneroo Geopark Project.

This presentation will outline the progress being made by the AGN to re-introduce geoparks into Australia highlighting the progress made so far in Western Australia.

THE GEODIVERSITY OF ZARBATIYA REGION IN SOUTH-EASTERN IRAQ

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This study aims to recognize and highlight the geodiversity of the Zurbatiya region which is located in the eastern part of Iraq, within Wasit Governorate. The main cities within the study area are Badrah, Jassan, and Zurbatiya, which are surrounded by several villages. The region has experienced significant tourism activity because of its geological diversity and geotourism which qualifies it to be a geopark in addition to climate and biodiversity. The geological diversity was studied by the field work such as structural and geomorphological elements, and hydrological characteristics like drainage patterns and springs. The tectonic location contributes to the existence of this geological diversity.

The area is occupied by different rock units reflecting the tectonic history and events building up the area. The exposed geological formations from older to younger within the study area are Fatha, Injana, Mukdadiya, and Bia Hassan formations, while the Quaternary sediments formed the Mesopotamia zone. The study area represents the boundary between the Low Folded Zone and Mesopotamian, the main deformations include folding and faulting. Moreover, several geological indications revealed that the Zurbatiya region is neotectonically active and deformation is still operative at the present time. Therefore, the geological diversity qualifies it to be a geopark. The study area represents a part of Himreen Structure which contains several minor anticlines and synclines from west to east; KaniSakht anticline, Al-Faraee syncline, Koolic 1 anticline, and Koolic 2.

In addition to the Kachaa thrust fault and Shushireen fault, weathering, erosion, lithology, and the structural elements play major roles in the formation of the geomorphological units and landscapes which exist in the study area, several types of geomorphological units are developed in the study area such as anticlinal ridges, Hogbacks, Cuestas and mesa and buttes, isolated hills, badlands, valleys and springs.

Keywords; Geodiversity, Geopark, Zurbatiya, structural elements, Iraq.

THE GEOPARK THAT OUR PEOPLE WANTS TO DO; BOTTOM-UP APPROACH IN VILLUERCAS-IBORES-JARA UGGP MANAGEMENT PLAN

López, Javier.; Cortijo, Iván.*; Barrera José María

Our Geopark is making the Management Plan for the coming years 2023 – 2027 under the UNESCO Guidelines, bottom-up approach is needed; the active participation of the local population in the proposals for actions to be carried out in the coming years.

We have organized 5 different Focus Groups (also virtual version) and in these meetings, people do different proposals: 1. Mayors and Local Administration. 2. Tourism. 3. Agro-food companies and cooperatives. 4. Youth and Women's Associations. 5. Multidisciplinary technicians and professionals.

As a final result, we want to underline:

More than 220 people have elaborated and participated in an ambitious Management Plan 2023 – 2027 from different points of view coordinated by Geopark staff and LEADER Local Action Group.

A complex document with SWOT analysis, about 600 pages, with maps, graphics, pictures, documents, etc..

622 actions are gathered in 10 axes of development in which the Geopark is the umbrella all of them are gathered: Proposals about Training Courses, Agriculture Products, Tourism Enterprises, Public Services, Promotion, Equality Gender and Youth policies, Networking, Infrastructures, Governance, Social Participation, Education, Digitalization, Climate Change, and New Energies are the main axes.

We have a democratic and participative bottom-up Management Plan for the next future to improve our Geopark, new employment, stop local emigration, and create good conditions for the next future, overall for women and youth.

IDENTIFICATION OF GEOLOGICAL WITH INTERNATIONAL VALUE IN MAROS PANGKEP UNESCO GLOBAL GEOPARK (MPUGGP)

Asri Jaya , Dedy Irfan and Dini Amriyani

Management Body of Maros Pangkep UGGp, Geological Dept, of Hasanuddin University.

Maros Pangkep UNESCO Global Geopark is located in the southern arm of Sulawesi Island. crossed by the Wallace Line, at 30 km from Makassar City in Maros and Pangkep Regencies, South Sulawesi Province and spanning in an area of 5,077.25 km², consisting of 44.6% land and 55.4% water. The area mostly includes in the Bantimurung Bulusaraung National Park on the mainland, the Kapoposang Water Tourism Park and the Liukang Tupabbiring Local Marine Conservation in the ocean. This geopark are inhabited 1,437 species of flora and fauna with 153 endemic species of Sulawesi and 52 protected endangered species. It is situated in the middle of Indonesia as the main entrance to eastern Indonesia and Sultan Hasanuddin Internasional Airport is included within the territory. Maros Pangkep UNESCO Global Geopark was developed by three main landforms, namely 1) Thrust Melange of Bantimala Complex, 2) Karst of Maros Pangkep, the terrestrial section displays the tower karst landscape known as "The Spectacular Towers Karst" and 3) Coral Reef Island of Spermonde Archipelago, each of which has a significant geological heritage, reflecting the combination of terrestrial and marine features which are interrelated with each other into a single landscape territory. The purpose of identification geodiversity mapping is to determine the deliniation for Maros Pangkep UGGp, and determine 21 geosites with geological international value. Recommendation for development of Maros Pangkep Unesco Global geopark is that the government should set several policies to delineate the geopark area.

JIKEY THE INTANGIBLE HERITAGE OF LANGKAWI UNESCO GLOBAL GEOPARK

Langkawi UNESCO Global Geopark is known for its natural beauty, but it is also home to a rich cultural heritage. Among its many traditions, the dance of Jikey stands out as a unique and captivating expression of the region's intangible heritage.



Background

Jikey is a traditional dance that has been performed in Langkawi for generations. It is typically performed during weddings, festivals, and other celebrations, and it is often accompanied by the music of a traditional Malay instrument called the gambus.

Intangible Heritage

Jikey is an important part of Langkawi's intangible heritage because it reflects the values, beliefs, and customs of the region's people. The dance tells stories of love, loyalty, and friendship, and it is often performed in groups, which symbolizes the importance of community and togetherness.

Significance

The dance of Jikey is an integral part of the cultural identity of Langkawi, and it is celebrated every year with a festival that showcases the best Jikey performances from around the region. By preserving and sharing this intangible heritage, the people of Langkawi are ensuring that the dance of Jikey will continue to be passed down through the generations.



Conclusion

The dance of Jikey is just one example of the many intangible traditions that make Langkawi UNESCO Global Geopark such a unique and fascinating destination. By experiencing and learning about this intangible heritage, visitors can gain a deeper appreciation and understanding of the culture, history, and people of Langkawi.

GEOTUR PROJECT “VALIDATION AND RECOGNITION OF TWO UNITS OF COMPETENCE IN GEOLOGICAL TOURISM”

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Geotourism is experiencing a strong momentum at the global level, promoted by policies of conservation and sustainable use of geodiversity and by the UNESCO Global Network of Geoparks. The consolidation of geotourism in Europe requires the training of highly qualified specialists that guarantees the valorization of geodiversity for nature tourism, as a source of income and job creation, while ensuring the proper conservation and management of the geological heritage, mainly in European Geoparks and rural areas with Sites of Geological Interest. The establishment of a high-qualified vocational training system has been the aim of the GEOTURISM Project, which has been presented through the EU ERASMUS+ programme.

Two new units of competence have been developed at the European level like professional qualification.

- Competence Unit 1: Provide accompaniment and assistance services to tourists and visitors and design geotourism itineraries through the Sites of Geological Interest.
- Competence Unit 2: Interpreting the geological heritage and its values to tourists and visitors of European Geoparks.

The results of the project have been translated into a VET curriculum, through the RVA (recognition, accreditation and validation) process of the curriculum. It is available a website of the project to check the whole information of the project.

In terms of the impact of the project, it has achieved 900 direct beneficiaries and 7200 indirect beneficiaries as a result of the intellectual products and multiplier events (seminars for the dissemination of such products), 3600 via the website.

Partners of the Project

- Subbética Cordobesa Local Action Group (Spain)
- Sierras Subbéticas UNESCO Global Geopark (Spain)
- Ensemble for Sustainable Development and Promotion of Rural Employment - ADESPER - (Spain)
- Training and Development - FOR.ES - (Italy)
- University of Bucharest (Romania)
- Novohrad-Nograd UNESCO Global Geopark (Hungary-Slovakia)

RESEARCH ON JIUHUASHAN GEOPARK CONSTRUCTION ON THE UPGRADING OF REGIONAL TOURISM ECONOMY

Wu Jingang, Ke Bin, He Fei, Yang Baogui

The Administrative Committee of Jiuhuashan UNESCO Global Geopark

Geotourism is an essential component of tourism. Geopark is an important place to carry out geotourism activities, and its construction achievements promote the upgrading and development of regional tourism. Jiuhuashan of Anhui Province is one of the four famous Buddhist mountains in China. Religious tourism has been dominated tourist market in Jiuhuashan for many years. In addition to the impact of COVID-19 pandemic, analysis on the number of tourists received by Jiuhuashan from 1991 to 2020 showed that the number of tourists to Jiuhuashan increased rapidly, and reached the maximum of 11.31 million tourists in 2019, but it had grown slowly since 2013. Because of geomorphological structure of mountain-hill-basin formed by large fault-block granite and the outstanding model of integration of geo-landscape and culture, Jiuhuashan was approved as a national geopark in 2009 and listed as global geopark in 2019. Focusing on the unique granite geology, landform and natural landscapes, Jiuhuashan built geotourism hardware and software facilities, created “Point – Line – Surface” geological popular science system. Then, geotourism became an important supplement to the tourism economy of Jiuhuashan. By comparing the number and growth rate of tourists received by Huatai scenic spot (mainly geotourism and eco-tourism) and Lianfeng Yunhai scenic spot (mainly ecotourism, and research and science popularization activities) in the Geopark from 2009 to 2020, the results showed that the proportion of the two scenic spots in the tourism economy of Jiuhuashan increased year by year. Moreover, the growth rate of tourists in the two scenic spots was higher than that of the whole Jiuhuashan, indicating that the construction of Jiuhuashan UGGp can promote the development of Jiuhuashan tourism. In the future, with the construction of Jiuhuashan UGGp, the implement of the master plan (revision) of Jiuhuashan Scenic Area and the opening of Jiuhuashan high-speed railway station (Chi-Huang high-speed railway), ecological tourism with geotourism as the main part will contribute to the transformation and upgrading of Jiuhuashan as a composite tourist attraction.

KHORAT UNESCO GLOBAL GEOPARK: LAND OF CUESTAS AND WORLD PALEONTOPOLIS

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A unique geological feature of Khorat Geopark important and apart from other existing UNESCO Global Geoparks is the presence of double sandstone cuesta ridges in the western part of the Geopark area. These ridges add to the scenic beauty and geological significance of the territory.

Another important feature of the Khorat Geopark is the abundance and diversity of fossils, particularly fossil mammals, reptiles, and petrified wood from the Neogene to Quaternary periods, and reptiles, especially dinosaurs, and other contemporaneous animals from the Cretaceous Period. These fossils can be found in all four directions from the outskirts of Nakhon Ratchasima Municipality, which is located in the eastern side of the Geopark area, or within a 20-kilometer radius from the city center. Therefore, we can refer to Nakhon Ratchasima, or Khorat, as a World Paleontopolis.

Nakhon Ratchasima City, or Khorat, located within the Khorat Geopark territory, is the largest community in Northeastern Thailand. It is home to a population of over 0.5 million people, residing in both the urban area and its surrounding areas. Nakhon Ratchasima acts as the main city and serves as the transportation, industrial, and commercial hub of the region. With rapid urban expansion encroaching upon areas rich in paleontological heritage, the Khorat Geopark has implemented a comprehensive plan to manage and develop a Paleontopolis. This plan includes the establishment of conservation areas, research facilities, academic services, and various forms of geotourism activities in the surrounding areas. These initiatives encompass parks, theme parks, museums, landscape gardens, and learning centers dedicated to fossils, including excavation sites. The aim is to conserve and conduct research on the fossil sites before they are transformed into areas for infrastructure construction, housing estates, commercial buildings, government buildings, and industrial plants.

ASPIRING GEOPARKS OF NORTH GYEONGSANG PROVINCE, KOREA

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North Gyeongsang Province (NGP) is located in the southeastern part of the Korean Peninsula and has excellent geodiversity due to its distribution of various rocks formed over various geological periods. And the various geological structures and topography formed in NGP have excellent landscape and preservation value.

In addition, NGP has very outstanding historical and cultural heritage along with this nature, so it needed a way to effectively preserve them. The Geopark is one of the three UNESCO nature conservation programs along with the World Heritage and the Biosphere Reserve, an integrated conservation program for geology, history, culture, archaeology, ecology, etc.

Therefore, NGP has actively introduced the Geopark to preserve the geo-heritage and develop it sustainably.

As a result, there are five Geoparks in NGP, four of them (Ulleungdo·Dokdo, Cheongsong, Gyeongbuk Donghaean, and Uiseong) have been certified as National Geopark of Korea, and Cheongsong was also designated as UNESCO Global Geopark in 2017. The other geopark, Mungyeong, is preparing to be certified as the National Geopark of Korea.

We would like to report on major geosites, geological importance, etc., with an introduction to each geopark.

EDUCATIONAL RESOURCES WITHIN THE ATLANTIC GEOPARK PROJECT (PORTUGAL)

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Geoconservation refers not only to conservation of the geological heritage but also to its valuation, namely through the implementation of educational services of practical value. This work proposes a geo-itinerary to the territory covered by the Atlantic Geopark Project (West Central Portugal) which includes the most emblematic geosites of each of the six municipalities that integrate the project. It was designed to meet the different curricular issues and the abilities that students must develop in each school year according to the Portuguese curricular documents, addressing basic geological concepts and ideas that ground the geological thinking, which are approached in a sustainable development perspective, i.e. involving the environmental, economic and social dimensions of sustainability (Table 1). This geo-itinerary, complemented by appropriate didactic resources, can be of great help to assist teachers in the required preparatory work in the frame of educational interventions including fieldtrips. It can also contribute to promote significant and relevant learning on geology and on geoconservation among the students, as well as to stimulate curiosity and interest for visiting other geoparks and for learning more about Earth Sciences.

Table 1 - Examples of different curriculum questions and skills that students should develop in each school year according to the Essential Learning (Portuguese Education Curriculum), related to geosciences themes in the most emblematic geosites of each of the six municipalities that integrate the Atlantic Geopark Project.

Grade (ages)	Issue/Abilities	Geosites (municipality)
4 th (9 – 10)	SOCIETY/NATURE/TECHNOLOGY - Recognize and value the natural and cultural heritage - local, national, etc. - and identify the natural elements in a landscape (e.g., geosites).	Miradouro do Castelo (Montemor-o-Velho)
5 th (10 – 11)	WATER, AIR, ROCKS AND SOIL - TERRESTRIAL MATERIALS - Interpret diverse information about the availability and circulation of water on Earth, enhancing knowledge from other disciplines (e.g. History and Geography of Portugal).	Lagoa da Barrinha (Mira)
7 th (12 – 13)	LAND IN TRANSFORMATION - Relate the expansion and destruction of the ocean floor to the Theory of Plate Tectonics (boundaries between plates) and the constancy of the Earth's volume and mass.	Livraria do Mondego (Penacova)
7 th (12 – 13)	LAND IN TRANSFORMATION - Explain processes involved in the formation of sedimentary rocks (sedimentogenesis and diagenesis) presented in different media (schemes, figures, texts).	Ançã (Cantanhede)
10 th (15 – 16)	GEOLOGY AND METHODS - Use principles of geological reasoning (actualism, catastrophism and uniformitarianism) in interpreting evidence of Earth history facts (stratigraphic sequences, fossils, rock types and landforms).	Cabo Mondego (Figueira da Foz)
11 th (15 – 16)	SEDIMENTATION AND SEDIMENTARY ROCKS - Explain the importance of fossils (age/facies) in relative dating and reconstitution of palaeoenvironments.	Ordovícico do Buçaco (Mealhada)

SUSTAINABLE TOURISM, A NEW TOOL FOR THE COLLABORATING ENTITIES OF LAS LORAS UGGP

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Las Loras UNESCO Global Geopark, Spain

Las Loras Geopark, a 1000 Km² wide territory, is situated to the south of the Cantabrian Mountain Range western sector, extending to the north of Burgos and Palencia regions. It was declared a UNESCO Global Geopark in 2017 and it is the only Geopark in Castille and Leon Autonomous Community for the time being. Sustainable tourism and the development of their local communities is one of the strategic priorities for geoparks. Several programmes and actions aimed at fostering and promoting sustainable tourism within the territory have been carried out by Las Loras Geopark. The agreement with the more than 70 Collaborating entities involves sustainability criteria and training related to geotourism. Furthermore, the Geopark is by now one of the tourist destinations included in the Spanish Ecotourism Club and many of the Geopark's collaborating partners are about to be accredited by the Club, and some of them are already accredited by the European Charter for Sustainable Tourism. Las Loras Geopark has a free accompaniment and advisory programme to enable their accreditations.

Other actions related to sustainability are also developed by the Geopark. Such is the case of the carrying capacity plan for a site of interest dealing with high numbers of tourists. Some of the measures aimed for this site are expected to be held soon. Work has also been done with local administration as to apply the criteria in new facilities and infrastructures.

Lastly, "Discovering the Geopark" is an innovative programme of guided visits which has been launched to accompany 30 people, maximum, through some of the geopark's geotrails and visit one of the collaborating entities, such as local producers, beekeepers, restaurants and others. Visitors are shown the main features of their work. The activity has a cost of EUR 5, and the money goes entirely for the partner that offers each of the participants a souvenir in exchange. A local ecotourism partner enterprise is hired by the Geopark to carry out the activity and a Geopark worker accompanies, interprets geological heritage and helps guiding the group.

Key words: Sustainable tourism, Collaborating entities, Geotourism.

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RESEARCH GRANT PROGRAM AS AN INSTRUMENT FOR THE CONSERVATION AND DISSEMINATION OF GEOLOGICAL HERITAGE

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Las Loras Geopark, a 1000 Km² wide territory, is situated to the south of the Cantabrian Mountain Range western sector, extending to the north of Burgos and Palencia regions. It was declared a UNESCO Global Geopark in 2017 and it is the only Geopark in Castille and Leon Autonomous Community for the time being.

Even before its declaration, several lines of action have been carried out related to research and knowledge transfer for local communities, and geological heritage protection.

The Geopark currently has a programme of aid to research with a budget over EUR 15 000 and three strategic priorities. On the one hand, a partnership agreement has been established between the provincial councils of Burgos and Palencia and the Department of Geology of the University of Salamanca, enabling research projects framed within the Geopark. On the other hand, an agreement with the local enterprise Gullón Biscuits was brought forward by the Geopark and a Euro 4 000 grant is awarded every year to any research group in Spain presenting a project within the Geopark. Furthermore, research on different fields has been developed by the Geopark with its own staff or through collaboration with other research groups. The grant and the agreements and collaborations involve the commitment by the researchers to carry out knowledge transfer activities for local communities by means of talks, field trips and information material undertaken in the framework of the European Geoparks Week and other events. The local population has occasionally been actively involved in the research process, collaborating with the scientific groups by collecting data or in field work.

Several proceedings referring to geological and mining heritage have been set up by the Geopark. The most important was the collaboration with Sargentos de la Lora town council to urgently declare its Oil Field as Asset of Cultural Interest, thus avoiding the dismantling of mining heritage connected to this field after the end of its exploitation. Furthermore, thanks to the support of the Geological Survey of Spain and the funding of the provincial council of Palencia, it was possible to rescue Cycadeoidea fossil trunks in Aguilar de Campoo reservoir, which were exposed due to the drought and were already being plundered. The works were fast, complex and hard but enabled the recovery of this exceptional palaeontological material and the future emphasis on its value.

ADVANCED STUDIES ON PALEONTOLOGICAL GEOSITES OF MUDEUNGSAN UNESCO GLOBAL GEOPARK, THE REPUBLIC OF KOREA

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Seoyuri Dinosaur Fossil Geosite

Seoyuri Dinosaur Fossil Geosite is the only paleontological geosite in the Mudeungsan UNESCO Global Geopark (UGGp), which is located in the Jangdong Formation of the Neungju Basin composed of well-stratified alluvial to lacustrine layers with pyroclastics. Seoyuri Dinosaur fossil site yielded about 1,500 dinosaur tracks, mainly theropod footprints. Also, nearly 60 trackways are found on the five different layers. Recent discoveries of pterosaur and dinosaur footprints from the Seoyuri Dinosaur Fossil geosite and surrounding areas indicate that the contemporary fauna of the Late Cretaceous was much more diverse and widespread than previously thought. In the Seoyuri Dinosaur Fossil geosite, at least three distinct types of pterosaur footprints are found across four different strata. Notably, within a single layer, approximately 300 footprints are found in high density (143 prints per square meter). These tracks exhibit manus dominantly and vary in size. Whether this size range encompasses adult pterosaurs or exclusively represents the juvenile or subadult individuals of larger pterosaurs, it is highly plausible that this region served as a colony for small pterosaurs.

Jeokbeok Red Cliffs Geosite

Jeokbeok Red Cliffs geosite is a well-stratified cliff that is one of the famous geological attractions of Mudeungsan UGGp. This is located near Dongbog Lake, which was created as a reservoir in 1971 to serve as a source of drinking water for Gwangju citizens. The recent extreme drought has dramatically reduced the lake's storage capacity and exposed the sedimentary layers beneath the lake. The footprints of sauropods, theropods, and ornithopods have been found in this area, with the outcrop showing theropod trackways. The data of these tracks were acquired using 3D photogrammetry to develop 3D models before water storage was restored. The Jeokbeok Red Cliff geosite is about 7 kilometers and is up from the Seoyuri Dinosaur Fossil geosite and is of upper layers. The dinosaur footprints in various areas around the lake and some outcrops between the two geosites suggest that many fossil sites could be yielded in the vicinity, and dinosaurs had been inhibited for a more extended period than previously thought. With further study, the variety of ichnofossils found in the Mudeungsan UGGp help us understand the ecosystems of the Late Cretaceous fauna. In addition, the diversity of these new and previous paleontological geosites could be an excellent attraction for visitors to this area in the future as a Geopark, as well as an educational resource.

**ADVANCED STUDIES ON PALEONTOLOGICAL GEOSITES OF MUDEUNGSAN UNESCO GLOBAL
GEOPARK, THE REPUBLIC OF KOREA**

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Seoyuri Dinosaur Fossil Geosite is the only paleontological geosite in the Mudeungsan UNESCO Global Geopark (UGGp), which is located in the Jangdong Formation of the Neungju Basin composed of well-stratified alluvial to lacustrine layers with pyroclastics. Seoyuri Dinosaur fossil site yielded about 1,500 dinosaur tracks, mainly theropod footprints. Also, nearly 60 trackways are found on the five different layers. Recent discoveries of pterosaur and dinosaur footprints from the Seoyuri Dinosaur Fossil geosite and surrounding areas indicate that the contemporary fauna of the Late Cretaceous was much more diverse and widespread than previously thought. In the Seoyuri Dinosaur Fossil geosite, at least three distinct types of pterosaur footprints are found across four different strata. Notably, within a single layer, approximately 300 footprints are found in a high density (143 prints per square meter). These tracks exhibit manus dominantly and vary in size. Whether this size range encompasses adult pterosaurs or exclusively represents the juvenile or subadult individuals of larger pterosaurs, it is highly plausible that this region served as a colony for small pterosaurs. Jeokbeok Red Cliffs geosite is a well-stratified cliff that is one of the famous geological attractions of Mudeungsan UGGp. This is located near Dongbog Lake, which was created as a reservoir in 1971 to serve as a source of drinking water for Gwangju citizens. The recent extreme drought has dramatically reduced the lake's storage capacity and exposed the sedimentary layers beneath the lake. The footprints of sauropods, theropods, and ornithopods have been found in this area, with the outcrop showing theropod trackways. The data of these tracks were acquired using 3D photogrammetry to develop 3D models before water storage was restored. The Jeokbeok Red Cliff geosite is about 7 kilometers and is up from the Seoyuri Dinosaur Fossil geosite and is of upper layers. The dinosaur footprints in various areas around the lake and some outcrops between the two geosites suggest that many fossil sites could be yielded in the vicinity, and dinosaurs had been inhibited for a more extended period than previously thought. With further study, the variety of ichnofossils found in the Mudeungsan UGGp help us understand the ecosystems of the Late Cretaceous fauna. In addition, the diversity of these new and previous paleontological geosite could be an excellent attraction for visitors to this area in a future as a Geopark, as well as an educational resource.

Keywords: Paleontological geosite; Dinosaur footprints; Pterosaur footprints; Mudeungsan UGGp; Seoyuri Dinosaur Fossil Site.

TAKING GEODIVERSITY MAINSTREAM IN THE CHABLAIS UGGP, FRANCE

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Since the mid 1980's the notion of nature with its dual living and non-living components has increasingly been replaced by the use of the term biodiversity. The mineral components of our planet and the processes that shape it have attracted less attention. This is marked by the evolving use of language and the fact that the term "biodiversity", which once was the preserve of scientists, today is used by the general public. The discussions, workshops and exchanges that have taken place in the Chablais UGGp over the last ten years have shown from a qualitative perspective how the general notion of nature has shifted to concentrate on living organisms.

As an active UGGp regularly working with the public, partners, school children and decision makers, it was decided to raise the profile of geodiversity. The Geopark sought to take the first steps in deepening the understanding of geodiversity, its relevance and importance. This included explaining its fragility. The aim was to lay the foundations so that in time geodiversity will become a familiar concept that is used as often as the word biodiversity.

The Chablais UGGp started to rebalance biodiversity and geodiversity within the Geopark for the local population, and for its visitors. Over the course of a year all events and communications were planned to build on this theme. Preparation time was used to reflect on how best to talk about geodiversity, how to provoke interest in geodiversity and how to change people's perspective on why it is not merely a backdrop, but a fundamental part of the natural world.

Given the omnipresence of biodiversity, it was decided start by explaining that together biodiversity and geodiversity make up the natural world. A known concept and an unknown concept. Working from here the Chablais UGGp used its familiar, emblematic biodiversity and geodiversity to explain the difference between the concepts. The next step went further and used numerous local cases to illustrate why geodiversity is so intimately linked to biodiversity and vice versa. In turn games, workshops and guided visits were developed for different publics, training was provided to our guides and explanations made to our politicians. Throughout the year these have been tested and adapted and will now form part of our Chablais UGGp event toolkit.

SHILIN GLOBAL GEOPARKS ENHANCES SUSTAINABLE TOURISM AND LOCAL DEVELOPMENT

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Shilin was listed as one of the first members of the Global Geopark Network in 2004 and became a UNESCO Global Geopark in 2015. Shilin Global Geopark is located in Shilin Yi Autonomous County, Kunming City, Yunnan Province, China. Shilin Global Geopark covers an area of 350 square kilometers. It is unrivalled in the multi-phase complexity of its evolution from Middle Permian to the present. On the world scale, Shilin is the best site that preserves and displays all pinnacle-like karsts, almost every existing distinctive pinnacle karsts can be identified in the park; Shilin contains a wider range of pinnacle shaped than other karst landscapes with pinnacles, and a higher diversity of shapes and colors that change with different weather and light condition.

Shilin Global Geopark attaches great importance to the protection of geoheritage resources and the development of geotourism, making important contributions to the development of local tourism and local economy. Specifically, geotourism has become a new breakthrough point in the tourism industry, and the geopark's visitors and revenue are growing. In 2019, Shilin Global Geopark received 3.63 million tourists, with a direct tourism revenue of 460 million yuan and a comprehensive tourism revenue of 2 billion yuan, achieving sustainable development of the tourism industry. The tourism industry has driven the common development of related industries, increased local fiscal revenue and employment opportunities for residents, and promoted regional economic and social development.

GEODIVERSITY PROMOTION ACTIVITIES (SPECIAL EXHIBITIONS, FIELD EXCURSION, SPECIAL LECTURE, TOURING EXHIBITIONS) BY COOPERATION OF UNESCO GLOBAL GEOPARK, NATIONAL GEOPARKS AND GEOPARK PROJECTS IN SHIKOKU, JAPAN.

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International Geodiversity Day was established by the UNESCO General Conference in November 2021. Among the concepts of 'diversity' related to Geoparks, although biodiversity and cultural diversity have been disseminated to some extent in society, Geodiversity is still in the process of being disseminated. GGN has been expected to play a leading role in the dissemination of Geodiversity. Therefore, Muroto UNESCO Global Geopark (Muroto UGGp, hereafter), in collaboration with the neighbourhood² National Geoparks (Gp) and 2 Geopark Projects (Gpp) in Shikoku Island of Japan, held a special exhibition focusing on Geodiversity in the Shikoku region from September to October 2022 with the support of the Japan Geopark Network Secretariat. This special exhibition was conducted in cooperation with each Gps and Gpps regarding the contents of the exhibition and exhibits such as geological specimens.

In the room of the special exhibition, panels were placed around the geological map of Shikoku to give an overview of the geodiversity of each region and explain the connection with nature and culture. Geological specimens symbolising the geodiversity of each region were placed in front of the explanatory panels. A special lecture by S. Hasegawa (SanukiGpp) was also held at Muroto UGGp during the exhibition period.

After the exhibition period, touring exhibition was held at TosashimizuGp (February – March 2023). Touring exhibition was also held at the Shikoku Seiyo Gp (April – May 2023) including gallery talks, which Earth Scientists of each region participated.

These dissemination activities not only promoted Geodiversity to the general public, but also contributed to the interregional exchange. The dissemination activities conducted in cooperation with several regions (UGGp, Gp and Gpp) could be one of the most promising options for disseminating Geodiversity.

Key Words: Geodiversity, International Geodiversity Day, Special exhibition, Regional network

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GOMBAK HULU LANGAT GEOPARK AS A CATALYST FOR SUSTAINABLE TOURISM AND LOCAL DEVELOPMENT.

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Gombak Hulu Langat Geopark (GHL) is the first Geopark in the state of Selangor and the 7th Geopark under the Malaysian National Geopark. This area covers two districts namely Gombak and Hulu Langat under the state of Selangor. The recognition of a local area as a Geopark has a significant impact on the local economy, tourism industry and local development. Within the administrative area of Selayang Municipal Council (MPS), there are 21 locations that have geological heritage value, while 8 and 2 respectively in the Kajang Municipal Council and Ampang Jaya Municipal Council.

This recognition has given added value to geosite preservation efforts which have already started in several locations. As this conservation effort does not prohibit any development activities, but it is allowed in a controlled and justified manner. The allowed and justified activities are often associated with the uniqueness of the rock within the area. Geosite of limestone hills is for rock climbing, abseiling, and BASE jump activities, while the quartz ridge for guided tourer, the lake for jet skiing and local recreation while the hot springs and waterfall are open for mass tourism subject to space and availability. These areas were developed carefully and meticulously to make it become known to various levels from local to international centres. This development subsequently boosts local socioeconomic activities where the products of local small and medium industries can be successfully marketed.

Through the recognition of GHL-Gp, the geocommunity is created with the participation of the main community players who are responsible for implementing educational programs based on geological heritage to the public. Among the community involved are the association, school, service provider, religious organization, local community and indigenous group. In the last 2 years more than 25 community players involved actively in this aspiring geopark. As part of the education and community engagement, our role includes controlling the intensity of development so that these geosites locations can be preserved as well as possible for the continuation of sustainable tourism.

THE FIRST GUIDED SNORKELING GEOROUTE OF GREECE AT THE LAVREOTIKI UNESCO GLOBAL GEOPARK

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Lavreotiki UNESCO Global Geopark occupies the southeastern part of Attica Prefecture and comprises the only UNESCO Geopark in Attica and close to the capital city of Athens. The geopark extends in the administrative region of the Lavreotiki Municipality, an area of 262 km² and bears a 73-km-long coastline. It hosts a plethora of geological, geomorphological, and cultural sites and represents a hidden gem in the shadow of Athens. Particularly in summer, the geopark's beaches attract the capital's residents as well as the tourists of the wider area. These Mediterranean-type beaches offer crystal-clear waters and high-quality services. Apart from the picturesque scenery and the touristic services, the underwater near-shore coastal zone hosts a rich geodiversity and biodiversity. For this reason and with the aim of the popularization of this wealth and in the same time achieving its protection through educational activities, we established the first guided snorkeling georoute at the marine environment in a Greek UNESCO Geopark. This is a unique georoute, bearing a small degree of difficulty as the only condition for the participation is the use of a diving mask, a snorkel and fins as well as the good buoyancy of the participant. The snorkeling georoute is 1 km long and includes a variety of geological and biological sites of interest. It starts from the central part of the Kakia Thalassa Bay, at the northwestern coastline of Agios Panteleimon mound, passes along the coast of this small mound and then follows the Kakia Thalassa beach and the southern rocky shores of the homonymous bay. Along the route, someone can admire the different types of biokarst such as the black phytokarst, tidal notches, and the coastal solutional cave of Giorgakis with the white calcitic rimstone pools. In the same intertidal zone, the respective biological zonation can be seen which is represented by endolithic and epilithic organisms. This biological activity is also responsible for the characteristic landforms of the biokarst. Another significant feature of this georoute is the Posidonia meadows which are quite dispersed in Kakia Thalassa. They are effective filters of the water column. Additionally, in specific sites along the route, peculiar tectonic structures can be admired which are also responsible for the tectonic stacking of the local rocks. The described georoute runs parallel to the coastline where the maximum water depth does not exceed 2-3 m. For certain categories of visitors such as families and children, the georoute can be restricted to a smaller distance.

THE OUTCOME OF THE 3D LASER SCANNING IN THE MINING GALLERY 'N^O 80' AS AN EDUCATIONAL TOOL

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Mining gallery 'No 80' represents the last site of the modern mining activity in the area of the Lavreotiki UNESCO Global Geopark (Lavrion UGG). It was opened by the French Mining Company of Lavrion between 1956-1958 and operated till 1977. This mine hosts one of the most important vein-type mineralizations in Lavrion, also known as 'Vein 80'. The latter bears a width of almost 2m and extends horizontally up to 1 km from Plaka village to Adami Valley. Besides that, this mining gallery yielded the discovery of 125 different minerals, including some type-locality ones. Another important feature in this mine, comprises the geosite of the detachment fault of the Lavreotiki region, belonging to the well-known Western Cycladic Detachment System, which constitutes the roof of the mining gallery 'No 80'. Along this detachment fault the Miocene exhumation of the Attic-Cycladic metamorphic core complex took place, leading to the formation of the famous silver deposits in the territory of the geopark. In general, the ore deposition in the Lavreotiki UGG is localized below, within, or above this detachment fault.

Often, geology includes strange and difficult-to-understand and/or visualize natural processes, making the explanation of them to non-geologists a true nightmare. The current technological advancements offer tools which facilitate the effective comprehension and communication of the various geological processes to the public. The 3D visualization of geomorphological landforms with the use of laser scanners is one of these modern tools. The employment of "structure-from-motion" techniques or terrestrial laser scanning in the geosciences has gained popularity. In this way, landforms representing the outcome of certain geological processes can be viewed and be understood. The detachment fault of the mining gallery 'No 80' is an unfamiliar feature to the public, thus a term without a respective image. With the use of a portable laser scanner, the personnel of the Lavreotiki UGG took the initiative for the 3D visualization of the mining gallery 'No 80' in order to virtually promote this specific geosite as well as the detachment fault, and make it familiar to the visitors of the geopark. The 3D heritage popularization of the detachment fault will facilitate: a) the comprehension of this landform, b) how the process of the detachment generated the deposition of the significant silver ore and lastly, c) how the geological setting of the Lavreotiki shaped the evolution of the Greek civilization from the ancient times until the modern era.

PROGRESS AND FUTURE PROSPECTS OF ICT UTILIZATION IN TOYAKO TOWN (TOYA-USU UNESCO GLOBAL GEOPARK)

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The Toya-Usu UNESCO Global Geopark aims to coexist with the ever-changing earth. The geopark is centered around Lake Toya — a caldera lake created by a huge eruption about 110,000 years ago — and Mt. Usu, an active volcano. Toyako Town is one of four municipalities that make up the Geopark. A part of the Geopark's activities is engaging in (1) disaster risk reduction education, (2) support for guided tours based on the characteristics of the geological environment, and (3) adding value to agricultural products. We have tried to make it easier for residents and visitors to understand and enjoy the Geopark by holding exhibitions at two visitor centers through the Ministry of the Environment. Additionally, we provide free access to walking trails and issue booklets summarizing the origins of the earth. However, it is difficult to disseminate information about exhibits through printed materials when they can only be seen locally. In order to deliver information to a wider variety of people, digitization of information is required. Since 2014, we have continued to conduct geological surveys, such as aerial photography inside the Toya caldera and underwater photography of the lake. In addition, we have added the survey results and filmed videos that we have collected into a digital archive. By digitizing video materials and survey results, it has become possible to show the formation of the earth rather than explaining it in words alone. Thus, it has become possible to use these visual materials to attract visitors for disaster risk reduction education as well as guided tours. In the future, we would like to enrich the information posted in the digital archive, which will lead to increased value of products and motivation to visit the geopark.

ETHICS: A TOOL TOWARDS SDGS "IMPLEMENTATION".

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UNESCO Global Geoparks, are committed to Sustainable Development, through various ways, implicitly and explicitly. The Norwegian Prime Minister Gro Harlem Brundtland opened the 1988 World Conference on the Changing Atmosphere with the call for "a new holistic ethic" in which economic growth and environmental protection go hand-in-hand around the world" and in 2015 the UN General Assembly adopted the 17 Sustainable Development Goals in order to transform our world referring to them as a comprehensive plan to achieve a better future for all.

Whatever Sustainable Development is and whatever meant, it seems that derives from the latest attempt to be answered the question of purpose of human activity on Earth and that of what way of life, human beings ought to pursue. But a shift in social paradigm requires a shift in moral reasoning and for that purpose no factor has been more influential than ethics, for the reason that the failure in our society mainly experienced as a failure to provide a fulfilling and sustainable way of life, "a good life for all". If there is not a shift in moral reasoning, any new paradigm proposed is condemned to fail.

The practical reason for the "new" interest in ethics and maybe their most significant contribution in that field is that ethics clarify the values at stake, express human moral conscience providing persons a code to express their moral intuitions and so help them to resolve value conflicts and give moral reasons for alternative courses of actions.

The "new" ethic must be if nothing else an ethic of interdependence that recognizes and promotes the mutuality of ecological and social values in communities, and the new paradigm, a collection of norms, beliefs, values, and habits, aiming to promote harmony among human beings and between humanity and nature.

SUSTAINABILITY DIAGNOSIS AMONG GEOPRODUCERS OF THE UNESCO ARARIPE GEOPARK

Ana Karine Gomes Duarte; Samuel de Souza Santos; Francisca Jeanne Sidrim de Figueiredo Mendonça;

Considering the exponential growth in recent years of Microentrepreneurs in Brazil, the opportunity was identified to carry out studies on the environmental impacts related to their production processes, understanding sustainable development as one that meets the needs of the current generation without harming future generations. The Sustainable Development Goals and the principles proposed by the UN Global Compact are used as a basis, thus applying scientific knowledge of Production Engineering to propose optimization opportunities. For this work, total sustainability is understood to be achieved when it happens in all its spheres, enabling environmental responsibility, economic growth, and social ascension. Therefore, the present research exposes the analysis of the workshops of geoproducers of the region of Cariri, that is, artisans who use manufacturing and reflect the regional culture in their production processes and/or final products. The data collected during the visits to the geoproducers allowed a diagnosis of the occurrence of the main problems that affect the achievement of sustainability and the total quality of their production lines. Those called geoproducers have their products related to the UNESCO Geoproduct program and must reflect the regional culture of the place in which they are inserted and in a sustainable way, obeying the precepts of the program. Based on the analysis of the data collected, guidelines were proposed using scientific knowledge, to enable and facilitate the path to achieving sustainability in all its spheres: environmental, economic, and social. In the improvement proposals, knowledge from the most diverse areas of Production Engineering was used to attribute technical-scientific value to the proposals. Thus, the research seeks to diagnose the position of the knowledge of producers regarding the sustainability of their processes and final products. After the diagnosis, ways of adapting the processes to the parameters determined by the Geoproduct program are analyzed and proposed to guarantee the preservation of the cultural and heritage identity of the region, with the environmental conservation subsidy proposed by the programs supported by UNESCO Geopark Ararape.

THE CHALLENGES OF CLIMATE CHANGE AND THE ROLE OF UNESCO GLOBAL GEOPARKS IN SUSTAINABLE DEVELOPMENT

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One of the most alarming contemporary challenges that the human being as well as other species of bio-diversity are facing is the problem of environmental degradation and rapid climate change. The present world is going through an age of economic globalisation where environmental ethics have often been compromised to have rapid economic growth and industrialization. Compromising the basic principles of safe environment, the rapid and unscientific use of natural resources, uncontrolled carbon emission in the name of gigantic industrialisation and modernisation, the contemporary world is facing the menace of environmental crisis in terms of global warming, which in every aspect questioning the basic preconditions of bio-diversity. In response to the unprecedented climate change various initiatives have been taken through international conferences by the international agencies, among which, perhaps the most common point where unanimity among the scholars is found, is on the point of sustainable development. In response to such growing crisis the UNESCO has initiated several attempts, one of the most remarkable is the establishment of Global Geoparks around the world. It is the most unanimous response to the most familiar conflict between industrialisation, development and the protection of environment for the sake of bio-diversity. The present paper seeks to focus on this issue of sustainable development and the role of UNESCO Global Geoparks as tools to cope up with the rapid climate change and its impact over bio-diversity. Moreover, it will attempt to examine the position of India regarding the establishment of geoparks under UNESCO as it has yet to inaugurate her first geopark yet.

PROMOTION OF RESPONSIBLE QUARRY DEVELOPMENT IN LINE WITH THE GEOPARK PRINCIPLES IN ITOIGAWA UGGP

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Itoigawa UNESCO Global Geopark records the history of the formation of the Japanese Archipelago (an island arc) and its geological diversity has nurtured rich ecosystems and culture. Early Carboniferous to middle Permian limestone called Omi Limestone bodies are widely distributed around Itoigawa's Mt. Kurohime. Omi Limestone is a geological heritage of high academic value, recording the growth of Paleo-Pacific reef-type limestone and environmental changes over 80 million years. However, Omi Limestone is also actively quarried for cement and carbide products, supporting industry and employment in Itoigawa for generations.

In 2020, as the operation in the current quarry is nearing its end, local quarry companies announced a joint development plan for a new quarry. The basic principles of geopark activities are to conserve geological heritage and realize sustainable societies. Therefore, efforts must be made to minimize environmental impact, conserve natural resources and record those which will be lost. To that end, an academic investigation committee consisting of experts, academics, and landowners was newly established within the Itoigawa Geopark Council to deliberate on the validity of the quarry's environmental impact assessment, as well as consider methods of investigation, recording, conservation, and the impact on the lives of residents. Under this system, from 2020 to 2022, we held several field surveys and committee meetings. We were able to discuss the environmental impact and value of the quarry site academically and establish the specifications and system for mitigating environmental impact and recording lost resources. To continue these activities into the foreseeable future, we established a successor committee in 2022 and concluded agreements among local governments, residents, and developers.

One means of balancing conservation and development is to draw a line between areas to be conserved and areas to be developed based on their academic value. While this method is clear, it potentially creates a division between the two sides. To make effective use of limited natural resources and minimize the associated environmental impact, it is necessary to have opportunities for all stakeholders in the region to sit at the same table. This presentation will introduce the activities of the academic committee and present the projected results of quarry development in the Geopark area as well as a research scheme (stacking record) for geological material that will be uncovered as development progresses.

Keywords: Local resource conservation, Responsible quarry development, Omi Limestone, Itoigawa UGGp

GEPARKS, GEODIVERSITY AND GEODIVERSITY MANAGEMENT: STUDIES, PROTECTION AND POPULARIZATION

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Abstract

The Upper Idrijca Landscape Park is a protected area with extraordinary geological, geomorphological, hydrological and botanical characteristics, as well as a high degree of natural conservation and richness of biodiversity. The park is situated in the Idrija UNESCO Global Geopark, with a number natural values and cultural monuments included in the UNESCO World Heritage List. Both natural – such as the lake of Divjezero, the banks and troughs of the Idrijca river, karst and tectonic features – and cultural – such as the klavže (water barriers), the Idrija lauf (forest railroad) and Feldban military narrow-gauge field railway. The Municipality of Idrija quickly saw the potential of the area and the need for its conservation: in 1993, the area of Upper Idrijca and Belca with their tributaries was declared a landscape park with a local decree (IUCN cat: V.). However, the declaration did not designate a specific park manager, resulting in almost 30 years of uncoordinated and ineffective park management. During this period, the area has become more widely renowned, and for many years, several sites in the park have been seeing a drastic increase in the number of visitors, particularly in summer, resulting in an overabundance of traffic, pollution, and noise. In 2020, the Municipality of Idrija delegated the role of park manager to the Idrija Tourism Board, which also coordinates the Idrija Geopark. In the first year, a capacity study was carried out to investigate the capacities of the most visited park sites, providing insight into the lack of infrastructure in the park in light of its current attendance. This was then followed by the preparation of the Management plan. The main goal of the document is to determine the management structure and to ensure the financial support for the landscape park in the next 10 years. The management plan will also foster sustainable development of the Idrija Geopark and preserve its natural, cultural, and geological heritage. The Management plan was confirmed by the Idrija Municipality Board in April 2022 and followed by implementing some concrete actions from the Plan until the end of the year. However, some activities to reduce motorized traffic, e.g. no-car weekends, parking fees, and the introduction of public transport (by bus) during weekends, when attendance is high, have been implemented already before the acceptance and will be continued afterwards. The measurements for managing the protected area also include local inhabitants by organizing workshops and establishing conditions to develop their businesses and encourage them with new ideas and trends to achieve higher value on their products. Other management concrete measurements, implemented this year are: i) free bus and the possibilities to park outside of the protected area, ii) establishing more bus stations to enable people to access several spots in the park by bus, iii) encouraging visitors to entrance the park in a sustainable way (bike, roller-blades, scooter, on foot,...), iv) designing an entrance point with the upgraded possibilities for sustainable mobility and parking at the entry point, v) establishing a park rangers services and control in the area and finally, vi) raising awareness among park visitors about the characteristics of protected sites and the need to respect and preserve them.

WATERWAYS AND STORIES ON THE E4 PATH AND THE GEOPARKS IN THE EASTMEDITERRANEAN (WATERWAYS), A COOPERATION PROGRAMME INTERREG V-A«GREECE– CYPRUS 2014-2020»

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The project concerns the enhancement and improvement of the attractiveness of areas of natural and cultural interest through the protection and promotion of important "water elements" on the E4 path in Crete and Cyprus.

E4 has special environmental, cultural, and historical value for the two islands. It runs through areas and monuments of special natural beauty which are part of European and international protection networks such as Natura 2000 and the UNESCO Geoparks network to which the Sitia (Crete) and Troodos (Cyprus) Geoparks belong. Recognition of them, as a comparative advantage, provides unique opportunities and possibilities for local communities for sustainable development and for promotion as geotourism destinations of excellence.

The project highlights the value and special features of geological and cultural heritage, contributes to the protection and preservation of the natural and cultural environment and raises public awareness about climate change and sustainability. It is a tool of an integrated social and economic sustainable local development. The partners designed and submitted this project proposal as part of a joint effort to meet the development objectives that aim to exchange best practices, adopt common approaches, implement joint actions, and produce common innovative products and services

SANQINGHONG: A MODEL PARTNER OF SANQINGSHANUGGP

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Sanqingshan UGGp at 30° north latitude is in the "World's High-Quality Tea Production Belt", where the four seasons are distinct with dense clouds and mists, nourishing the rich aroma of tea; where the soil is yellow-brown, thick, rich in phosphorus and potassium, and high in organic matter. Tea plants at Sanqingshan are mainly distributed in mountainous granite regions at an altitude of 400-1600 meters. The granite body is rich in grid-like cracks, filled with an abundance of structural fracture water, providing selenium, zinc and other trace elements for tea plants.

The representative of the Sanqingshan tea industry, Sanqingshan Yuansheng Tea Co., Ltd., is a partner of Sanqingshan UGGp. In recent years, under the policy guidance, financial support, brand publicity, and product promotion from the Geopark, the company has successfully built the Sanqinghong brand, including six kinds of tea such as black tea, green tea and golden tea, as well as tea products, daily tea chemicals, tea utensils, tea clothing, tea-themed homestays and other products. In the meantime, educational tea tourism has been developed, and special courses from surveying tea mountains, identifying tea trees, experiencing tea production to on-site teaching and interaction have been designed. In 2021, it was approved to become Shangrao Education Practice Base for Elementary and Secondary Schools. It actively promotes the development of the rural economy for the benefit of local communities. Sanqinghong has made great contributions to promoting the development of the rural economy and benefiting local community residents. Sanqinghong has become a model partner of Sanqingshan UGGp, which other geoparks and partnerships could learn from.

FOSSIL VERTEBRATES OF PHOSPHATES OF MOROCCO

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The phosphate deposits in Morocco come mainly from the basins of OuladAbdoun, Gantour, Meskala and Oued Eddahab. Maastrichtian phosphate deposits are also known in the Middle Atlas (Bekrit and Timahdit regions) and High Atlas, near Ait Ourir, and in the Ouarzazate basin.

The genesis of phosphates of Morocco started about 72 million years ago (MA), during the Late Cretaceous, in a shallow epicontinental seafloor along the eastern margin of the Atlantic. This phosphate sea was home to an exceptional biodiversity illustrated today by the multitude and the great diversity of the fossils found in the different layers of the phosphate series from Maastrichtian to Lutetian. A unique record of around 24 Million Years, documenting the history of life and two major biotic crises: the Cretaceous-Tertiary and Paleocene-Eocene mass extinctions.

The first paleontological studies on phosphate fossils goes back to the first half of last century and date from the 1930s. Since these pioneering works, the faunal list has continued to increase and currently, includes more than 350 species of fossil vertebrates.

Except amphibians, all major taxonomic groups of vertebrates are known in the phosphates of Morocco. Marine forms (selachian and actinopterygian fishes, mosasaurs, plesiosaurs, crocodiles, birds and turtles) are the dominant representative of this fauna. Terrestrial vertebrates are also known (non-avian dinosaurs, ocean-going pterosaurs and mammals). These later as well as the non-avian dinosaurs lived on land. Their death bodies were transported by rivers from the continental hinterland to the sea where they were deposited and then fossilized.

During the past decades, the phosphates of Morocco have revealed an unsuspected paleontological richness in both marine and terrestrial vertebrates. These new discoveries underline the fossiliferous potential of Morocco's phosphates that can be exploited over the long term.

CREATING LINKAGE BETWEEN GEOLOGY AND ARCHAEOLOGY: CASE STUDY IN WIANG NONG LOM GEOHERITAGE SITE, THAILAND

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The area of Wiang Nong Lom has been defined as a wetland with national importance for more than 20 years. It is located in Chiang Rai Province, northern Thailand. This area plays an important role in the livelihood of local people, as it serves as agricultural areas, buffalo farming, fishery, and bird watching spots. Additionally, numerous archaeological excavations have taken place in this area, revealing many antiques related to the legendary ancient city named Yonok Nakpan. Historical records indicate that around 1,000 - 1,500 years ago, Yonok Nakpan was a civilized city but was destroyed by collapsing and flooding in just one night, leaving nothing behind but a small island.

From a geological perspective, the landforms of Wiang Nong Lom are influenced by the Mae Chan active fault. Consequently, various geological features related to the active fault can be observed, including sag ponds, hot springs, offset streams, and triangular facets. Trench surveys have provided evidence of multiple earthquakes occurring in this area, with the most recent significant one being a 6.5 magnitude earthquake approximately 1,500 years ago. Nowadays, Wiang Nong Lom is still experiencing movement due to the Mae Chan active fault, with a maximum rate of movement recorded at 1.5 mm per year. While the effects of past earthquakes may not be evident, a sag pond created by the active fault is gradually increasing in size and depth, eventually becoming the huge wetland known as Wiang Nong Lom. With this geological evidence, it is plausible to consider the possibility that Yonok Nakpan, the ancient city, was destroyed by an earthquake.

Given the strong connections between geological, archaeological, and historical records, Wiang Nong Lom is classified as a geoheritage site of Thailand and is part of the aspiring Chiang Rai geopark. In response, various projects have been initiated to raise awareness about the site's significance and promote tourism among both the local people and the general public. These projects include creating video footages, establishing indoor and outdoor geology learning spaces, and organizing workshops for local students.

PARTICIPATION OF THE DRAA ZAGORA GEOPARK ASSOCIATION AT THE 10TH INTERNATIONAL CONFERENCE ON UNESCO GLOBAL GEOPARKS

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The Draa Zagora Geopark Association, a dedicated advocate for the preservation of geological heritage and sustainable development, is thrilled to participate in the 10th International Conference on UNESCO Global Geoparks. As an emerging geopark in the heart of Morocco, the Association recognizes the significance of this prestigious event in promoting geotourism, fostering global cooperation, and exchanging best practices among geoparks worldwide.

The Draa Zagora Geopark Association views its participation in this conference as an invaluable opportunity to showcase the diversity of geological landscapes, cultural heritage, and environmental assets of the Draa Valley and the Zagora region. By actively engaging with practitioners, researchers, decision-makers, and geopark enthusiasts, the Association aims to strengthen its position and progress towards achieving UNESCO Global Geopark status.

During the conference, the Geopark Draa Zagora Association intends to present its ongoing efforts in the identification, conservation, and community engagement of geosites. It will highlight its initiatives promoting sustainable tourism, local economic development, and educational programs that instill a sense of pride and stewardship among local communities.

Furthermore, the Draa Zagora Geopark Association plans to actively participate in thematic sessions, workshops, and networking events of the conference. By exchanging knowledge and experiences with established geoparks and experts in the field, the Association aims to enhance its capacities in geotourism management, geoscience education, and geopark governance.

The participation of the Draa Zagora Geopark Association in this conference aligns with its long-term vision of becoming a UNESCO-recognized Global Geopark. Through engaging in constructive dialogues, forging partnerships, and learning from the experiences of established geoparks, the Association aims to refine its geopark proposal, demonstrate the value of its unique geological heritage, and establish a framework for sustainable development in the region.

In conclusion, the participation of the Draa Zagora Geopark Association in the 10th International Conference on UNESCO Global Geoparks signifies its commitment to advancing the objectives and principles of the geopark movement. By actively engaging in this global platform, the Association seeks to acquire knowledge, establish collaborations, and refine its strategies to realize its aspiration of becoming a UNESCO-recognized Global Geopark in the near future.

SOCIO-ECONOMIC BENEFITS AND PROBLEMS OF ECOTOURISM BUSINESS IN PROTECTED AREAS: PERSPECTIVES FOR THE IMPLEMENTATION OF ESG-MODELS ON THE EXAMPLE OF YANGAN-TAU GEO PARK

Khasanova A.I. , *Autonomos non-commercial organization CSEECT Yangan-Tau Geopark*

The successful development of the Yangan-Tau Geopark has become a significant source of economic growth for the depressed area of Salavat District, Republic of Bashkortostan. Ecotourism has attracted significant investment, created jobs and promoted local entrepreneurship. The region's infrastructure has also improved thanks to the geopark, including roads and communications. Strict nature and biodiversity protection measures have helped preserve unique ecosystems and rare species of animals and plants, attracting scientific research and educational programmes.

The Geopark has worked actively to preserve cultural heritage and engage the local community. Charitable services for people with limited mobility show its social responsibility. The introduction of ESG models helped to balance environmental, social and management aspects. The example of the Yangan-Tau Geopark demonstrates the potential of sustainable ecotourism and the application of ESG models for regional development and conservation of natural resources. It is necessary to continue research and initiatives to achieve a balance between environmental responsibility and economic development in ecotourism in specially protected areas.

It is important to note that the development of the Yangan-Tau Geopark has long-term prospects. Ecotourism has contributed to the diversification of the region's economy, reducing dependence on certain industries and seasonal fluctuations. In addition, the sustainable development of the geopark maintains a healthy balance between natural resources and economic interests, helping to preserve the unique ecosystems and traditions of the local population.

Continued work on ecotourism and the application of ESG models can become a driving force for the development of other regions with specially protected natural areas. Given the growing interest in sustainable tourism on the part of tourists and broad public support, regions can strengthen their efforts towards more responsible and sustainable development.

In this way, the Yangan-Tau Geopark has become an inspiring example of successful implementation of ecotourism and ESG models, allowing the combination of economic benefits with the protection of nature and cultural heritage. Continued co-operation with local communities, state authorities of the Republic of Bashkortostan and businesses will ensure long-term sustainable development and well-being of the region, as well as preserve the unique natural heritage for future generations.

MANAGEMENT OF GEODIVERSITY AND GEOSYSTEM SERVICES IN GEOPARKS: A CASE STUDY OF THE CHABLAIS UNESCO GLOBAL GEOPARK, FRANCE

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This study assesses the effects of human activities and natural processes on geodiversity and geosystem services in Geoparks through the use of the Drivers-Pressures-State-Impact-Response (DPSIR) framework. Geoparks are places that have been set aside with the intention of preserving, managing, and promoting geological heritage and the accompanying natural and cultural aspects. This study concentrates on evaluating the abiotic ecosystem services that geodiversity offers, such as the quantity and quality of water, terrestrial processes, etc.

We applied the DPSIR framework in two geosites, Lake Montriond and Lake Vallon, located in Chablais UNESCO Global Geopark in France. In the past, due to slope instability these two alpine lakes were formed within Pleistocene glaciated valleys. They are categorized as dynamic oligotrophic lakes that have been landslide-dammed. While the region's geodiversity is still not fully understood, the biodiversity of the area has been extensively investigated and carefully managed. Our aim is to increase knowledge in order to make a better assessment of the natural and human factors that are putting pressure on the state of the environment and could have an impact on geodiversity and geosystem services. According to our investigation, these geosites offer crucial geosystem services. Moreover, these geodiversity and geosystem services are significantly impacted by human activities like tourism, leisure, and resource extraction as well as by natural phenomena like climate change and dynamic processes.

The results of this study include the geosystem services maps and DPSIR assessment tables that can help the appropriate administrative authorities to build the right management strategies and solutions to meet these challenges. These can include geosystem services monitoring and assessment, water management, sustainable tourism development, restoring and rehabilitating degraded landscapes, and so on. We argue that a thorough understanding of the intricate relationships between human actions, natural processes, and the geodiversity and geosystems themselves is necessary for the effective management of geodiversity and geosystem services in Geoparks.

This study emphasizes the value of the DPSIR framework as a tool for raising awareness of geodiversity, providing policymakers, managers, and stakeholders with useful advice, and advancing sustainable development and conservation in Geoparks.

Key words: Geodiversity, Geosystem services, Geoparks, DPSIR, Chablais UNESCO Global Geopark

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DANYANG ASPIRING UNESCO GLOBAL GEOPARK

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The Danyang Geopark is located in near the central of the Republic of Korea, which is situated in East Asia. Its center coordinates are 36.980° latitude and 128.339° longitude. The boundary of Danyang Geopark is composed of the entire administrative area of Danyang County, and its total area is 781.06 km². The average annual temperature is 11.5°C (ranging from 6.6°C to 17.5°C), and the total annual precipitation is 1,113.3mm.

Geographically, it is located in the central part of the Korean Peninsula, and throughout ancient times to the present, it has a wealth of historical relics and cultural traditions that have been left behind as a result of significant power struggles. Also, the natural ecosystem in Danyang Geopark is considered to be one of the finest in South Korea.

Danyang has a balanced distribution of igneous, metamorphic, and sedimentary rocks. These rocks exhibit geological diversity, including granitic gneiss (1.87 billion years old, covering 40% of the surface area) from the Paleo-proterozoic era, limestone, quartzite, shale, and sandstone (67%) from the Paleozoic era, and conglomerate, sandstone and granitic rocks (23%) from the Mesozoic era.

The Danyang region preserves a continuous sequence of rock formations from the Paleozoic and Mesozoic eras, excluding the Devonian period. This makes it a valuable source of information for studying the depositional environment during these geological periods. Furthermore, this region features well-developed folds and faults (especially thrust faults), making it geologically intriguing in terms of structural geology. In particular, this region holds international significance for understanding tectonic characteristics and researching the evidence of three significant tectonic events that had occurred in East Asia, which are superimposed in this area.

The geological heritage of Danyang Geopark holds international value due to the following:

In East Asia, there has been a long-standing academic debate regarding the extension of the collision zone of North and South China. The rock profiles, geological structures, fossils, and paleomagnetic characteristics in Danyang provide highly important information for understanding the geological history of the Korean Peninsula and East Asia.

Research on the limestone cave deposits in Danyang (published in Nature) has provided important information on the large-scale paleoclimate variations in East Asia, contributing to the enhancement of conservation awareness for caves. In Danyang, the presence of the middle Darwillian carbon isotope excursion (MDICE), globally reported during the Ordovician period, is reported for the first time in the Sino-Korean Craton, making it a significant location.

Danyang Geopark, features such as karst topography with caves, thrusts and folds, unconformities (including 1.2 billion years of gap), fossils etc. are included in geosites. It contributes to the activation of the local economy through geotourism, showcasing the scenic beauty and cultural and biological significance of the area.

ASPIRING GEOPARKS OF NORTH GYEONGSANG PROVINCE, KOREA

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North Gyeongsang Province (NGP) is located in the southeastern part of the Korean Peninsula and has excellent geodiversity due to its distribution of various rocks formed over various geological periods. And the various geological structures and topography formed in NGP have excellent landscape and preservation value.

In addition, NGP has very outstanding historical and cultural heritage along with this nature, so it needed a way to effectively preserve them. The Geopark is one of the three UNESCO nature conservation programs along with the World Heritage and the Biosphere Reserve, an integrated conservation program for geology, history, culture, archaeology, ecology, etc.

Therefore, NGP has actively introduced the Geopark to preserve the geo-heritage and develop it sustainably.

As a result, there are five Geoparks in NGP, four of them (Ulleungdo-Dokdo, Cheongsong, Gyeongbuk Donghaean, and Uiseong) have been certified as National Geopark of Korea, and Cheongsong was also designated as UNESCO Global Geopark in 2017. The other geopark, Mungyeong, is preparing to be certified as the National Geopark of Korea.

We would like to report on major geosites, geological importance, etc., with an introduction to each geopark.

GEPARK CAMPUS – COMBINING GEPARK SCHOOLS AND CULTURAL SERVICES

Mikko Kiuttu, *Rokua UNESCO Global Geopark*

Rokua UNESCO Global Geopark has developed a Geopark school concept to encourage schools to integrate Geopark themes and values in their teaching. In Muhos, one of the three municipalities in the Geopark, there are located three Geopark schools: one secondary school, one upper secondary school and one adult education centre. All the units are located in neighbouring buildings. In addition, there is a cultural centre of the municipalities in a close vicinity.

A few years ago, the upper secondary school was re-built. Already in the planning phase, the architect and the designing team, including also the teachers, wanted to integrate the Geopark's themes in the school building and bring the nearby nature visible in everyday life of the school. They chose to use colors from Geopark's logo and local nature in the walls of the school, erect a social art work to the school's main entrance representing the local geology and the partner school and Geopark in German, as well as decorate the corridors with photographs. They have also used a lot of timber in furniture. In the teaching, they respect curriculum which has the Geopark's themes and values in the very core. In addition, they are encouraging and educating students to sustainable life style.

At the same time, a new Rokua UGGp exhibition was erected in the neighbouring cultural centre. The exhibition tells the story of the local landscape from geology to the human history and folk tales. The exhibition also utilizes virtual reality technology to demonstrate the ancient landscapes. The exhibition is open and visible for every visitor in the cultural centre and, in addition, it is used by the nearby school in their education.

The secondary school and the adult education centre are located in neighbour of the upper secondary school and the cultural centre. The adult education centre runs public Geopark courses frequently. In turn, the secondary School carries out their own curriculum in which the Geopark is integrated in different subjects.

Together, these Geopark schools and the cultural centre form an entity, which spreads Geopark knowledge and values for local inhabitants of different ages and also serves as a business card for the visitors. Even the school building can be thought as an outdoor exhibition. The entity has gained a nickname "Geoparks campus" among the locals. The Geopark campus is a nice example of a multi-layered educational model.

HOW TO VISUALIZE “WHAT IS A GEOPARK?”

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The aim of this study is to identify how the concept of Geoparks has been visualised. Cases from Japan, where the presenter lives, and other countries around the world are examined.

First, definitions and descriptions of Geoparks are compared. Then, the concepts of UNESCO Global Geoparks and Japanese Geoparks, including academic papers and official websites of each geopark, are examined to explore how they have been visualised. In most academic papers, the nature of geoparks tends to be described as the intersection of different concepts and activities and as a process of community improvement by geoparks. Illustrations of geopark initiatives tend to be used to show how geoparks can be applied to the future of communities and societies in less developed countries, rather than in Europe or China where geopark activities started earlier.

However, the geopark concept is not well visualised on many geopark websites. They simply provide a definition of a Geopark in the form of text and a logo, or display a picture of their region. Those explaining the concept attempt to visualise and communicate geopark initiatives in their area.

In Japan, on the other hand, pyramid charts have been popularised to illustrate what 'geo' means. In Japan, there has been a tendency among geopark stakeholders that a geopark is not a geological park, which may have led to the tendency to visualise what is "geo".

Geoparks are characterised as areas where 'geo' is presented in a fun and easy-to-understand way. It is important that we consider more with each other how we can visualise 'geo' so that the general public understands its importance.

PROMOTING SUSTAINABLE TOURISM THROUGH CYCLING – TWO BILLION YEAR TOURS CYCLING ROUTES IN LAUHANVUORI - HÄMEENKANGAS UNESCO GLOBAL GEOPARK, FINLAND

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Lauhanvuori - Hämeen kangas UNESCO Global Geopark (LH Geopark) located in the western part of Finland and covering an area of approximately 5 000 km² in a rural setting has only some 40 000 inhabitants. The population is concentrated in small towns and villages, and there are wide wilderness areas between the settlements. The Geopark, including nine municipalities, lies in the fringe of three provinces.

Geology of LH Geopark consists of four distinct elements: the Palaeoproterozoic granitic bedrock, the Ediacaran/Cambrian sandstone remnant of Lauhanvuori, the Palaeozoic to Quaternary multi-layered sediment cover and the Holocene peatlands. These elements tell the story of development of the landscape from an Alpine type mountain range 1 900 million years ago to a flat mire covered peneplain of today.

Before the establishment of the LH Geopark, the tourism industry of the area was marginal in general. The Geopark concept and the utilization of the geotourism potential of the area was seen as a promising tool to enhance local economies as a whole and particularly in the touristic point of view. Numerous projects, mainly funded by the European Rural Agricultural Fund for Rural Development, have taken place in recent years to develop the nature tourism infrastructure and the businesses of the area.

One of these initiatives was the Geopark's cycling tourism project which took place between years 2020 and 2023 to promote sustainable tourism in the area and thus to realize the UN's Sustainable Development Goals. Currently the visitors reach the Geopark's sites and destinations mainly by private cars. The new Geopark-wide cycling route network was established to enhance the accessibility of the sites by bicycles possibly combined with public transport. Cycling tourists spend long time in the destination and use many services supporting local tourism businesses.

The Geopark's cycling route was designed in co-operation with local people using Participatory Geographic Information Systems' methods on the Maptionnaire platform. People were asked to comment route suggestions, which were refined based on feedback. On this new Two Billion Year Tours (TBYT) cycling route the Geopark's geological story "From Mountains to Mires" may be experienced by bike. Long interconnected routes, shorter local routes, mountain bike routes and routes that connect the TBYT route to the EuroVelo 10 route and other cycling routes nearby are included. The information about the cycling routes, attractions, and tourist services is available online on the Outdooractive platform. On the routes cycling events guided by LH Geopark's experts are organized.

PROGRESS AND FUTURE PROSPECTS OF ICT UTILIZATION IN TOYAKO TOWN (TOYA-USU UNESCO GLOBAL GEOPARK)

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The Toya-Usu UNESCO Global Geopark aims to coexist with the ever-changing earth. the geopark is centered around Lake Toya a caldera lake created by a huge eruption about 110,000 years ago and Mt. Usu, an active volcano. Toyako Town is one of four municipalities that make up the Geopark. A part of the Geopark's activities is engaging in (1) disaster risk reduction education, (2) support for guided tours based on the characteristics of the geological environment, and (3) adding value to agricultural products.

We have tried to make it easier for residents and visitors to understand and enjoy the Geopark by holding exhibitions at two visitor centers through the Ministry of the Environment. Additionally, we provide free access to walking trails and issue booklets summarizing the origins of the earth. However, it is difficult to disseminate information about exhibits through printed materials when they can only be seen locally. In order to deliver information to a wider variety of people, digitization of information is required.

Since 2014, we have continued to conduct geological surveys, such as aerial photography inside the Toya caldera and underwater photography of the lake. In addition, we have added the survey results and filmed videos that we have collected into a digital archive. by digitizing video materials and survey results, it has become possible to show the formation of the earth rather than explaining it in words alone. Thus, it has become possible to use these visual materials to attract visitors for disaster risk reduction education as well as guided tours. in the future, we would like to enrich the information posted in the digital archive, which will lead to increased value of products and motivation to visit the geopark.

Key words: ICT (Information and Communication Technology), disaster risk reduction education

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THECORUMBATAIGEOPARKPROJECT

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This presentation draws attention to the international significance of the Corumbataí Geopark Project. The area of the Corumbataí Geopark comprises the eastern margin of the Paraná Sedimentary Basin, central part of the State of São Paulo, Brazil. This geopark represents about 300 million years of Earth's history, distributed over 170 sites of geological interest in an area of over 1.700 km². The oldest outcrops spectacularly illustrate important features of the late Paleozoic icehouse. The overlying Permian rocks exemplify marine and coastal paleoenvironments that are rich in animal and plant fossils. The most distinguished of these are mesosaurid reptiles from the Irati Formation, one of the most important marker beds for the Gondwana supercontinent. Specimens of these reptiles from the geopark's territory were compared to those of South Africa by Cope in 1886, a major contribution to the development of the continental drift concept. Further up in the geopark's stratigraphy, the Mesozoic is represented by a shift to a continental environment, culminating in a desert being covered by one of the World's largest lava floods, expelled from the Earth's mantle when Africa and South America began to drift apart. These desert sands now comprise the Guarani aquifer, the World's second largest, which is both recharged and exploited by hundreds of thousands of people within the geopark's territory. Besides its hydrological richness, other geosystem services (Gray, 2011) have played roles in the occupation of the region by prehistoric groups since 10,000 years ago, as evidenced by rock art, lithic artifacts, and pottery. Another highlight is the geopark's relief, featuring flat hills and gentle slopes that contrast with the steep-sided regional cuesta and buttes. This unique region combines great areas of human occupation with sites of natural and cultural significance, hence the urgent need to establish a sustainable development model, such as a UNESCO Global Geopark. The Corumbataí Geopark project began in 2016 with a group of local stakeholders developing programmes for geoconservation through science, education, visibility, and networking. Of the Park's 170 inventoried sites, 18 are actively used in educational and geotouristic activities. Many others are regularly studied and visited by professional and student Geoscientists from within the State and elsewhere. In 2022, the working group published detailed information and abundant illustrations of the territory (Kolya et al., 2022). Highlights of the project so far include close partnership with universities, networking with more than one hundred local touristic entrepreneurs, an educational programme for schools, and specialized monitor for environmental interpretation on geosite visits. In 2023, the group pursued the consolidation of the Geopark and formal submission of its candidature for UNESCO's International Geoscience and Geoparks Programme.

**GEOSITE MAPPING FOR CONSERVATION AND SUSTAINABLE USE: CASE FROM KINTA VALLEY
ASPIRING GEOPARK, MALAYSIA**

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Geosite is a basic component of geopark development and its development is still not given much attention. The development of geosites requires a sequence of studies, namely identification, characterisation, evaluation, and development planning for conservation and geotourism. All these can be done if we have a strategic mapping programme. When mapping geosites, the focus is not only on the geological heritage value but needs to involve landscape, biological, and cultural heritage values. Mapping also needs to focus on delineation, protected sites, geotrails, recreational areas, and public education facilities. As this geosite is related to the tropical karst landscape, we introduce a micro-karst and micro-habitat mapping approach as the basis of integrated heritage value determination. This paper discusses an example of a geomorphological geosite mapping case study in the Kinta Valley Aspiring Geopark.

EDUCATIONAL ACTIVITIES ON CLIMATE CHANGE IN THE LESVOS PETRIFIED FOREST AND THE PROTECTED AREAS OF LESVOS ISLAND UNESCO GLOBAL GEOPARK (GREECE)

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The Petrified Forest of Lesvos and the protected areas of Lesvos Island UNESCO Global Geopark are of the main features used for education activities on climate crisis understanding for school students and awareness raising on climate change consequences for the local community.

The Natural History Museum of the Lesvos Petrified Forest plans, organizes and implements the educational program "Climate change: I learn about its effects by observing the Petrified Forest of Lesvos". The main objectives of the program are: to understand climate change consequences, to find the connection between climate change and the loss of biodiversity by studying the present-day and the fossilized ecosystem of the Petrified Forest of Lesvos area, to understand how our daily behavior and the consumption of energy, burden the environment and to encourage students to take action to reduce their own carbon footprint.

The Natural History Museum of the Lesvos Petrified Forest and the Kalloni Environmental Center initiated a series of activities and events to raise awareness on the value of the protected areas and especially on the wetlands of West Lesvos and biodiversity protection. The activities are organized in cooperation with local stakeholders, local associations, the Region of North Aegean and the Municipality of Western Lesvos.

All activities are organized in the frame of the project «Actions to promote protected areas of Lesvos», funded by the Regional Operational Program "North Aegean 2014-2020".

**COOPERATION AMONG SCHOOLS IN UNESCO GLOBAL GEOPARKS
SCHOOL CLASSES PRESENT AND SHARE THEIR EXPERIENCES AND ACTIVITIES IN LESVOS GEOPARK,
GREECE AND MAIELLA GEOPARK, ITALY**

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Lesvos Island UNESCO Global Geopark (Greece) and Maiella UNESCO Global Geopark (Italy) organized a cooperation activity among schools from the two Geoparks.

In this school exchange activity participated four schools from Lesvos Island UNESCO Global Geopark (the 9th primary school of Mytilene, the 10th primary school of Mytilene, the Paleokipos primary school and the Pamfila primary school) and four schools from Maiella UNESCO Global Geopark (the Guardiagrele primary school, the Guardiagrele secondary school, the Manoppello secondary school and the San Valentino secondary school)

We present the methodology, the implementation and the results of the education activity that was organized during the school year 2023 in Lesvos Geopark and Maiella Geopark. Based on the success of the educational activity implemented in 2023 the activity will continue also during next year.

During this cooperation programme students and teachers worked intensively for several months, on UNESCO Global Geoparks and studied the characteristics and more important elements of natural and cultural heritage in their Geoparks. At the end of the school year three online exchange meetings were organized where the students had the opportunity to communicate, present their work, and exchange ideas for realization of programs and activities and the development of a spirit of cooperation through Geoparks also in the future. During the online meeting the schools fostered with great success a sense of cooperation and networking through Geoparks.

**THE HELLENIC GEOPARKS FORUM - WORKING GROUP ON EDUCATION:
A NEW INITIATIVE FOR IMPLEMENTING EDUCATIONAL ACTIVITIES IN UNESCO GLOBAL GEOPARKS
IN GREECE AND CYPRUS**

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The Hellenic Geoparks Forum - Working Group on Education was established by the Hellenic Geoparks Forum on March 8, 2023.

The Education Working Group consists of two representatives from each UNESCO Global Geopark in Greece and Cyprus:

1. Lesvos Island Geopark (2000, 2012)
2. Psiloritis Geopark (2001)
3. Chelmos – Vouraikos Geopark (2009)
4. Vikos – Aoos Geopark (2010)
5. Troodos Geopark (2015) - Cyprus
6. Sitia Geopark (2015)
7. Grevena – Kozani Geopark (2021)
8. Kefalonia – Ithaka Geopark (2022)
9. Lavreotiki Geopark (2023)

Since its establishment, the Working Group on Education is organizing regular weekly as well as extraordinary meetings in order to prepare and implement the activities of its 'Action Plan'. According to its 'Action Plan', the Working Group on Education is working for the achievement of five main goals:

1. Communication and promotion
2. Implementation of common actions
3. Networking & collaboration with other entities
4. Activities for the good operation of the committee, the cooperation & communication between its members
5. Implementation of the SDGs

One of the main goals of the Working Group on Education is the development of collaboration and partnerships with the UNESCO Chair on Geoparks and Sustainable Development of Insular and Coastal Areas of the University of the Aegean, UNESCO ASPnet schools, the Environmental Educational Centers in Greece and Cyprus, Environmental Information Centers, Universities, Museums, Research Centers, and other educational institutions.

THE WONDERFUL WORLD OF THE NAGY-BEREK MARSHLAND: AN ATYPICAL, YET 'GEOPARKIAN' VISITOR CENTRE IN THE BAKONY–BALATON UNESCO GLOBAL GEOPARK, HUNGARY

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Although we always emphasise the holistic concept of geoparks, which means the conservation and presentation of abiotic and biotic assets and cultural heritage of the area, our experience is that a typical visitor centre in a geopark is dominated by geological knowledge and exhibits, illustrations on geological phenomena, etc. We believe that an area without wild gorges, spectacular minerals, rocks and fossils, also deserves geotourism facilities and services.

A small visitor centre opened last year near Fonyód, on the southern shore of Lake Balaton. The aim of the visitor centre is to present the unique littoral wetlands (local term for them: 'berek') that once surrounded Lake Balaton. The bogs have almost disappeared as a consequence human activities. The fate of these areas is intertwined with Lake Balaton, which is of major importance in Hungary, especially for tourism.

The visitor centre focuses on the Nagy-berek ('Great Berek'), which still shows traces of the once extensive marshland. The main attraction is an exhibition on the geological history of the area, the evolution of Lake Balaton, the wildlife of the area and how man has shaped this landscape. The staff introduces visitors to the world of the 'berek' through presentations, activities, and guided tours.

Five thousand years ago, our ancestors were already familiar with an image of Lake Balaton which survived until the middle of the 19th century. The shape of the lake was much the same as today. The most striking difference between the lake then and now is the presence of the 'berek' (marshlands), some of which are still present in patches. The two largest of these are the Kis-Balaton ('Small Balaton') and the Nagy-berek, which once formed an integral whole with Lake Balaton. The 'berek' of the southern shore of Lake Balaton were created by the prevailing north-westerly winds. The waves generated by the winds created barriers (baymouth bars), behind which the 'berek' were formed.

The restless, landscape-shaping man has not only regulated Lake Balaton and the waters that feed it, but also the 'berek', in order to make them cultivable and exploitable. The owners of these areas succeeded in regulating Lake Balaton by lowering the water level, largely with public money. Their efforts were crowned with success. In 1821 they dismantled one and later several water mills in and around Siófok. Their dams had prevented the waters of Lake Balaton from flowing down the Sió (a largely artificial watercourse capable of draining the water from Lake Balaton into the Danube). The removal of the dams lowered the water level of the lake and thus the 'berek' by about 2.5 metres. This marked the beginning of the regulation of Lake Balaton, which irreversibly sealed the fate of the 'berek' and the lake. Later, in 1861, a railway was built on the southern shore. The railway company that invested in the project, in order to protect the railway line and in cooperation with the growing and expanding beach associations, succeeded in building the Sió Canal, which could be operated in a regulated manner, and led to a further reduction in the water level of Lake Balaton and the 'berek'. At the same time, special associations were established, whose work over the decades left only a trace of the former wetlands. Today's Nagy-berek, with its drained landscape, although still enchanting and rich in treasures, are the work of man. The Fehérvíz Bog Nature Conservation Area in the south and small patches of the 'berek' that remain in places indicate the amazing marshland that once lay here.

USING GIS TECHNIQUES AS VALUABLE TOOLS FOR THE CARTOGRAPHIC REPRESENTATION OF GEOSITES IN THE MASSIF DES BAUGES UNESCO GLOBAL GEOPARK.

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This poster presents work carried out as part of a PhD thesis comparing geosites management methods in 2 UGG working together: M'Goun (Morocco) and Massif des Bauges (France) Geoparks.

The ongoing inventory of geosites is one of the conditions for success and for maintaining UGG status. How to integrate ongoing addition of geosites to the management of the geosites collection grounding a Geopark is the stake of the study, analysing first the strategy used by the Massif des Bauges UGG to manage the increase from 50 initial geosites to 73 current ones. Using GIS and implementing a new database is the solution explored, allowing to create new types of maps and integrate in the database various pertinent details such as the date of selection, site classification, management tools employed, and evaluation scores based on the National Geological Heritage Inventory (INPG) methodology in France.

In a second time, a new GIS database will be created for the M'Goun UNESCO Geopark, based on the Bauges model. This database will be used for the proper management of the various geosites of the territory (updating, characterization, information).

This example shows the interest of scientific collaboration between Geoparks in terms of experience sharing and technology transfer.

CLIMATE CHANGE IMPACT ON GLOBAL GEOPARKS MANAGEMENT: EXPERIENCE SHARING FROM THE MASSIF DES BAUGES AND THE M'GOUN GEOPARKS.

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Today, according to various intergovernmental expert reports, there is no longer any doubt that climate change is accelerating and intensifying and the reason for that goes back to man-made activities. In the framework of a collaborative programme based on a comparative study, this presentation investigates the adaptation efforts of two territories, namely the Massif des Bauges UNESCO Geopark characterized by a cool, humid climate, and the M'Goun UNESCO Geopark with a dry, warm climate, in response to the impacts of climate change. Both territories experience hotter spells, drought periods, reduced snowfall, and water stress, impacting agriculture, natural environments, risk management and water resources. The focus of this presentation is on the strategies employed to mitigate and adapt to these changes, involving residents, elected representatives, and socio-economic partners in a transition process to limit the impact of climate change, including the future of winter tourism in the Massif des Bauges.

The main levers for mitigating the impact of climate change include reducing energy consumption from the highest-emitting sources (such as the residential and transport sectors), improving process efficiency, enhancing carbon storage, and promoting non-carbon-emitting renewable energies. Adaptation measures need to be implemented systematically and across the board, covering all possible areas. Both Geoparks are focusing on supporting the climate transition in different sectors of activity, mobilizing stakeholders and partners around this major issue. In the Massif des Bauges, the Geopark accompanies the ski resorts, imports understanding tools to better manage problems related to climate change. First retracement concerning 3 ski-resorts (Aillons-Margériaz; Le Semnoz; and La Sambuy ski resorts) are observed, after initiatives have been taken to diversify their tourist activities, and creating alternatives to winter tourism and promoting year-round tourism (concept "four seasons") beyond the winter season, The Geopark continuously work with the National Office of Forests and The National Forest Property Center, the departments and the region of Auvergne-Rhône-Alpes to promote and protect the capacity of forests to mitigate and adapt to climate change by participating in the Regional Strategic Plan and the Regional Plan for the wood sector 2023-2027, and within the framework of the European Agricultural Fund for Rural Development (EAFRD). In the M'Goun Geopark, the High Commission for Water and Forests, along with the Ministry of Agriculture and Maritime Fisheries, play significant roles in combating erosion, deforestation, and desertification. They develop and implement policies for conservation, sustainable development of forests, and sylvo-pastoral resources. Institutional mechanisms are established to coordinate policy formulation, execution, monitoring, and evaluation in combating desertification and contributing to rural development.

In addition, some strategic geosites are used or could be used as indicators and educational supports to record and show the effects of the climate change on natural processes and human activities.

GEOHERITAGE MANAGEMENT AND VALORISATION: EXPERIENCES TO SHARE BETWEEN THE MASSIF DES BAUGES AND THE M'GOUN GEOPARKS.

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This presentation focuses on two exemplary UNESCO Global Geoparks: the Massif des Bauges in the northwestern Alps of France and the M'Goun Geopark in the central High Atlas Mountain range in Morocco. The Massif des Bauges has held the status of a Regional Nature Park since 1995 and became a Geopark in 2011. Its management is overseen by a "mixed syndicate" consisting of 91 elected members representing various entities such as the Region, departments, EPCI (intermunicipal cooperation establishments), and communes. Scientific and technical committees are also involved in the management process. On the other hand, the M'Goun Geopark, established as a Geopark in 2014, receives strong support from the Regional Conseil of BéniMellalKhénifra. It is administered by the Council of Orientation and Monitoring, the Provincial Council of Azilal, and the Grouping of communes. The management of the M'Goun Geopark is entrusted to the M'Goun Geopark Association (AGM), which collaborates closely with scientific and technical committees to implement coordinated actions, and it has established new organizations within the territory to strengthen its presence.

Both Geoparks demonstrate significant efforts in developing, preserving, and promoting their geoheritage and geosites. They employ various means such as informative panels, scientific excursions, human and internet-based mediation, and the creation of technical tools and interactive games in specific and iconic geosites (Creusates peat bog, Prér rouge caves, and Discovery trail of the Masters of the Deserted Mountain in the Bauges), BinelOuidane Lake, Rock engravings, Tizi-n-Tighist and ZaouitAhançal in the M'Goun) and museums (e.g. the new Azilal Museum in the M'Goun Geopark). Beyond these basic actions required for each UGGP, specific and innovative tools for geosites management are experimented in a collaborative manner by the two Geoparks (experience sharing through a franco-moroccan partnership programme PHCT): geosites inventory and database using GIS tools, geosites management plan, collaborative and participatory approaches for geosites development and valorisation... This participatory approach gathering citizens, local stakeholders (especially geopartners) and elected representatives, is enhanced by continuously offering training programs to raise awareness and educate about the local stakes linked with geoheritage and geosites, fostering social involvement and empowering the participants. These initiatives encompass continuous development in educational and geotourism content, incorporating local cultural aspects, related to the Baujus identity in France and Amazigh culture in Morocco.

LINKS BETWEEN GEODIVERSITY, FLORISTIC DIVERSITY AND ECOSYSTEM SERVICES AT THE CHELMOS-VOURAIKOS UNESCO GLOBAL GEOPARK

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Chelmos-Vouraikos UNESCO Global Geopark is a member of the Global Geopark Network since 2009. Apart from its unique geodiversity, Chelmos – Vouraikos is also characterized by rich biodiversity as well, thus, it has been designated as a National Park. In this work, the diversity of the geological substrates of the 40 designated geosites of Chelmos-Vouraikos UNESCO Global Geopark were linked and correlated with floristic diversity and the ecosystem services of the area. Ecosystem types were delineated and mapped at the MAES (Mapping and Assessment of Ecosystem and their Services) level 3. Identification and assessment of ecosystem services (supply and demand) provided by the national park's ecosystem types were classified using the Common International Classification of Ecosystem Services (CICES). Ecosystem services were identified and assessed through the recording and analysis of the main anthropogenic activities in the area of the Geopark, as well as through the determination of the impact of geosites on the conservation of specific plant species. The results presented in heat-maps for the areas of geosites occurrence and the important areas of ecosystem services identified the areas of the Geopark with significant elements of geodiversity and the simultaneous presence of endemic flora species. These areas were highlighted as important for the provision of ecosystem services, e.g., geodiversity conservation, biodiversity conservation, recreation, grazing. Finally, the value of the special geodiversity and biodiversity of the Chelmos-Vouraikos UNESCO Global Geopark is highlighted in terms of ecosystem services importance that can be rendered as a competitive advantage for the integrated management of the National Park and Geopark.

GEODIVERSITY AND BIODIVERSITY IN KHORAT GEOPARK AND THE PARTICIPATION OF CITIZEN SCIENTISTS

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The geodiversity of Khorat Geopark is closely linked to its remarkable biodiversity. With a Tropical Wet and Dry climate, Khorat Geopark is home to diverse ecosystems, including dry evergreen and deciduous dipterocarp forests. These habitats support a wide range of flora and fauna, including rare and endemic species. In 2021, Khorat Geopark initiated a citizen science program using the iNaturalist platform. Citizen scientists, including students from Geopark Schools and the general public, actively participate in surveying and collecting data within the geopark.

The geopark area is mostly represented by the Lam Takhong river basin, a tributary of the Mun River. The Lam Takhong is regarded as an antecedent river that existed prior to the formation of the cuesta mountain ranges. The river has gradually penetrated deeper during the tectonic uplift to form the water gaps. The upheaval of the terrain to form the cuestas has provided various ecosystems on a dip slope side. An area with an elevation over 600 meters above MSL is suitable for the dry evergreen forest ecosystem, while the area downslope has transformed into a deciduous dipterocarp forest ecosystem. The diverse ecosystems on the cuestas and low-lying areas have created different habitats for flora and fauna, as well as various human agricultural activities.

The participation of citizen scientists by directly engaging in surveying and monitoring these ecosystems has been instrumental in increasing awareness of Khorat Geopark's rich biodiversity. This involvement fosters a sense of responsibility and promotes the need for sustainable management of natural resources. The data collected by citizen scientists are valuable resources for estimating changes in biodiversity and informing management planning. Scientists, conservationists, and related agencies can use this data to identify rare and endangered species, monitor population dynamics, and evaluate the effectiveness of conservation efforts in the future.

Additionally, the collected data provides insights into changing trends in biodiversity, facilitating effective management planning. By carefully analyzing the data, scientists can identify areas that require special attention or conservation measures, contributing to the preservation and restoration of ecological balance within Khorat Geopark. The interconnectedness of geodiversity and biodiversity in Khorat Geopark emphasizes the importance of preserving and appreciating its unique ecosystems. The active involvement of citizen scientists, combined with the utilization of collected data, plays a crucial role in raising awareness, promoting sustainable resource utilization, and making informed decisions for the conservation of biodiversity within Khorat Geopark.

POLITICS OF POST-DISASTER IMPACT ASSESSMENT IN INDIAN SUBCONTINENT WITH SPECIAL REFERENCE TO INDIA

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Disaster defined as catastrophic situation in which the normal pattern of life or eco system has been disrupted and extraordinary interventions are required to save and preserve lives and or the environment (Ministry of Home Affairs, Govt. of India, 2011). The Indian subcontinent is highly vulnerable to cyclone, droughts, earthquakes, floods. Huge population of the region and the unplanned urbanization have forced people of subcontinent to live on marginal lands or in coastal areas. The natural disaster directly impacts economy, agriculture, food security, water, sanitation, the environment and health. The subcontinent always witnesses politics of post disaster impact assessment. In India, post-disaster impact assessment is always been politically motivated. Same scenario is also being seen in Bangladesh and Sri Lanka also. Political parties of the region are always playing political card at the time of impact assessment and at the time of distribution of aids. In this situation real scenario of damages and losses are not accounted accurately and affected people are losing which they deserve. Reconstruction is not going in right direction due to nasty politics. In the recent past, coastal regions of India and Bangladesh had been badly affected by some of the strongest cyclones like 'Aila', 'Fani'. And 'Amphan'. Due to these devastating cyclones the coastal regions of India and Bangladesh are badly affected due to huge loss of human life, domestic animals and huge amount of property. But the political parties of both the countries engaged in nasty politics at the time of assessment, distribution of rehabilitation and reconstruction of the region. So, the aim of the paper is to analyse the importance of post-disaster impact assessment and the politics of impact assessment, rehabilitation and reconstruction.

EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD) - AN EXAMPLE FROM UGGP VULKANEIFEL

Kummer Sabine and Schüller Andreas

Nature park and UNESCO Global Geopark Vulkaneifel, Germany

Abstract

Germany's eight UNESCO Global Geoparks are working together on a project to achieve the 17 goals of the UN Agenda 2030 through educational opportunities at the local level. The project is funded by the Federal Foundation for the Environment as part of the call "The Great Transformation: Sustainability Dilemmas and Dealing with Uncertainties". The focus of the project is to (1) methodically and didactically strengthen multipliers on ESD and SDGs in the UGGPs; (2) communicate and live the SDGs and ESD to the public by (3) developing learning modules for target group-oriented implementation of ESD and SDGs.

Each German UGGp has its own regional context and thus offers the opportunity to make different conflicting goals tangible at the regional level. A central USP of the UGGp in relation to ESD is their holistic view of the Earth system and the past-present-future principle: Participants learn about the history of the earth and can use methods from ESD to shape the future together and find their own role in shaping the socio-ecological transformation.

The UGGP Vulkaneifel is developing an ESD learning module on the sustainability dilemma "Mining of volcanic raw materials as a conflict between human economy and landscape conservation". The target group of the two-part learning module is the fourth class of a primary school. In the future, the module will be extended to older target groups. The first part is an introduction to the topic in the classroom. The aim of the module is to make the children familiar with open quarries and the properties of rocks. There is also time for reflection and philosophizing, for example about where and when the rocks were formed. The children themselves develop how quarrying changes the landscape. In the second part of the module, the children go on an excursion to a local quarry to observe biological and geological diversity. The didactic aim is to actively engage the children in the dilemma between resource extraction and landscape conservation and the creation of valuable secondary biotopes.

The documents of the learning modules will be improved with the knowledge of a test phase and could possibly be adapted and used in other geoparks dealing with these topics.

**DINOSAUR FOSSIL HUNTER TRAINING ACADEMY: A COLLABORATION BETWEEN PHUWIANG
DINOSAUR MUSEUM AND KHONKAEN ASPIRING UNESCO GLOBAL GEOPARK**

Passkorn Kunthasap, Petsaifar Pongpanich

*KhonKaen Aspiring UNESCO Global Geopark, PhuWiang Dinosaur Museum and Fossil Research Center,
Thailand.*

KhonKaen (a)UGGP is in the KhonKaen province, to the northeastern of Thailand. Known as the valley of dinosaur kingdom, this territory encompasses an area of Phu Wiang National Park, Wiang Kao District, and PhuWiang District, with an area of 1,038 sq. km. The territory of the Geopark features the Phu Wiang Dinosaur Museum and Fossil Research Center, the first of its kind in Thailand established after the first dinosaur fossil discovery in 1976. The museum is one of KhonKaen Geopark's main partners, assisting each other on paleontology and research as both unit shares the same goal to educate the public and raise awareness on importance of geoheritage.

Stemming from the same insight, after the establishment of KhonKaen Geopark in 2018, a cooperated permanent project was launched as an activity zone under the name of "Dinosaur Fossil Hunter Training Academy", where children take on a role of dinosaur excavation team trying to find fossils in a mock excavation site.

First of all, the children would be informed about the rules of the mission and the overall progress. They will then be briefly taught about dinosaurs, the mass extinction, how to use each of the geologist tools, and how to handle fossils properly. After that, the children would be taken to the mock excavation area where they enjoy the activity with their friends. When all the toy fossils were "found", the children then relocated them safely to the safekeeping as the session closes with another emphasis on why this process and our paleontological heritage is important. "Don't hit your friend on the head with this tool, they ain't made from rock", "These are the treasure of our land, once broken they are irreplaceable" and "Each piece holds million years of Earth's memory" are some of the most memorable quotes from this fun and awareness-raising activity for the young.

GEO HIGH SCHOOL - THE OFFICIAL NAME GEOLUKIO SINCE JAN 1, 2020

Laitila Annie

The possibility to follow the general upper secondary school curriculum or the natural science programme. This year, we have 50 students; some have moved here from around the country, we have one exchange student, and a few double-degree students. Lappajärvi with its surroundings provides an interesting environment to study and observe scientific phenomena, especially through the geological formations.

The bedrock and the soil in the area show a cross-section of the geological processes from 1.9 billion years ago until the rare meteorite impact 78 million years ago and the crater formation that it created. In addition, several glacial periods have shaped the area.

Hence, the natural science programme offers a good opportunity to familiarize oneself with the scientific phenomena and processes by doing research in practice, taking and analyzing samples in the Lappajärvi area.

The natural science programme focuses on natural sciences such as biology, geography, physics, and chemistry in which you may freely select compulsory and optional study units. The programme also includes six advanced study units designed to explore natural sciences from different perspectives.

The aim is to explore natural sciences and clarify your future plans. To develop scientific reasoning. To prepare you for the matriculation examination and further studies in natural science. After finishing the programme, you will get a separate certificate and a grant. The programme does not exclude studying other subjects.

What is it like to study at Geolukio?

Flexible pedagogical support services: e.g. easy access to remedial and special needs education. According to pedagogical surveys, our students are target-oriented: their goal is to achieve a good general education (88% of the students) and to succeed well in the matriculation examination (94% of the students). Our teachers know how to teach, and they have a good command of their subjects.

Ikeda Kaguen - a partner high school in Japan

Ikeda Senior High is located in the Geopark region of Kagoshima, Southern Japan, next to the volcano Sakurajima. Every year, they organize an international science competition called the "Global Scientist Award" that the high schools around the Lappajärvi area can participate in. In the autumn of 2022, three Geolukio students took part in the competition in Japan.

We begin the work online via video conferences (discussions, presentations, shared research tasks, etc.), gradually expanding the cooperation. The goal is to learn more from each other about local natural science phenomena.

A GENERAL INTRODUCTION AND RESENT DEVELOPMENT OF LEIQIONG UNESCO GLOBAL GEOPARK HAIKOU AREA

Laitila Annie

Leiqiong UNESCO Global Geopark is located in the southern margin of Chinese mainland, straddling Qiongzhou strait. It has a unified single boundary with total area of 3,050km².The geology is characterized by the Leiqiong Rift Volcanic Belt and records the origin of Leiqiong Rift and the spreading of the South China Sea Basin.

The geopark is located in the transition zone between tropical and southern subtropical areas. Dominated by tropical rainforests with rare plants, abundant fauna and favourable environment, it is famed as the “Tropical Volcanic Ecological Museum of China”.

The diversified types of volcanoes, deep blue sea, fertile red soil, evergreen mountains and clear water all tone up to the harmonious beauty of red, blue and green.

The Haikou Park is located in Shishan and Yongxing Town, 15 kilometers southwest of Haikou City, Hainan Province, with an area of 108 square kilometers. The scenic spot ranks top in the "One Hundred Scenic Spots in Qiongzhou" of Hainan International Tourism Island. It is a tourist attraction integrating popular science education, sightseeing tourism and health care. It is the only tropical city volcano cluster world geopark in China.

In resent years, The park has built a science popularization base, carried out science popularization activities on campus, actively participated in various geological park joint activities, and actively contributed to the world geological park network.

In the near future, and under the context of Hainan's construction of a free trade port, the future development vision of Leiqiong Haikou Park is to enrich the park's tourism consumption business, optimize the tourism consumption environment, and expand tourism Marketing channel.

A GENERAL INTRODUCTION AND RESENT DEVELOPMENT OF LEIQIONG UNESCO GLOBAL GEOPARK HAIKOU AREA

Lanery

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A SET OF INTEGRATED TOOLS TO POPULARIZE GEOLOGY AND GEOHERITAGE TO THE WIDER PUBLIC

Lansigu Christophe⁽¹⁾, Desbois Jean Luc⁽¹⁾, Hobléa Fabien⁽²⁾

- 1. Massif des Bauges Nature Regional Park and Global UNESCO Geopark*
- 2. Edytem, CNRS-University Savoie Mont Blanc (Chambéry, France)*

The Massif des Bauges is one of the sub-alpine ranges in the French Alps. Over the last few years, the Massif des Bauges UNESCO Global Geopark has developed a range of coherent tools to present geology in the most attractive way possible. The latest tools created include a new film with striking 3D animation sequences, as well as a discovery booklet, a poster, and a portable folding tarpaulin containing all the essentials for presenting and understanding the massif.

The latter brings together the key elements for understanding:

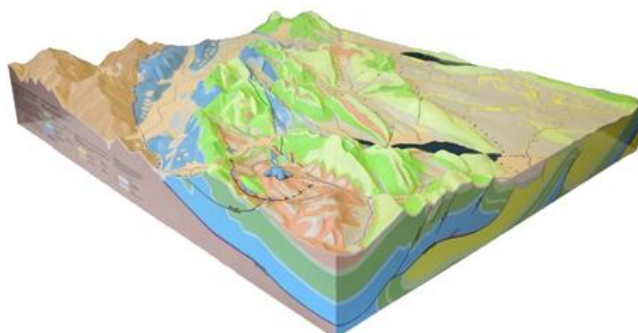
1. the concept of geological heritage;
2. everyday examples of the use of mineral resources;
3. the role of geology in exposure to natural hazards; and
4. key representations for understanding the chronology and stages in the construction of landscapes (rocks, structure, erosion morphologies).

These new tools complement and confirm the need for intuitive iconography to explain our geological heritage. These tools are made available to our public or to our network of sites and mediators. They help to interest the public in the concepts of geology and how they are expressed in the landscapes that surround them.

The relationship between the use of natural resources on a day-to-day basis - water and other mineral resources - is another area in which the Geopark is working, with particular emphasis on Geodiversity Day. The emphasis has recently been placed on the issue of water resources: our region, traditionally regarded as a water tower, has also had to contend with severe droughts. This new situation is an opportunity to explain how our aquifers work. The aim is to get the public to take ownership of the issue of the limits to natural resources and to involve them in the implementation of a transition that is collectively constructed and understood.

In this presentation, we will review the various tools that have been developed and the contexts in which they are used.

Simplified geological 3D model, of the Massif des Bauges UGGp



GEOMORPHOLOGICAL LANDSCAPES

Abdellah LAOUINA, *Mohammed V University*

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The multiplicity and variety of geomorphological landscapes recall the importance of their management, targeting representative sites, which can be included in the repertoire of original environments that deserve to be studied and visited, because they contain remnants of past dynamics, such as the cold-related forms of the Pleistocene ice ages in the Atlasic heights and witnesses of water processes in the foothills or Aeolian processes in Saharan landscapes. This directory will be useful for education, scientific research and cultural tourism. Without necessarily recommending binding protection measures for geomorphological heritages, such as those recommended for biological heritage, the identification of expressive geomorphological landscapes allows them to be recognized, studied and their characteristics displayed on educational materials.

For this, the means are to use the landscape for the promotion of educational visits and specialized tourism, extolling the qualities and value of its constituents, to train professionals involved in landscape management, development and planning and to strengthen in school curricula and those of nature tourism trips, the promotion of landscape knowledge.

The state of abandonment of some sites of great importance and the lack of cultural infrastructure around, prevent the launch of a dynamic of development. This is why urgent actions are required, including the mobilization of local actors with a view to managing heritage sites and remains and funding, for demonstration and information projects. Raising awareness about landscape heritage should be a permanent concern of the public authorities and civil society, including the organization of study trips for students and pupils, the drafting of textbooks and educational materials for information and analysis. Scientific research must attest to the particular interest of each site, its degree of originality to help the decision on the treatment to be given to each case

Geomorphological landscapes, precious, for the picturesque they offer, and even more so for the content in remnants of the dynamics of the past, can claim a status allowing to fix the possible actions of pedagogical valorization, with a view to the training of students, tourists and local actors. It would therefore be useful for the awareness of the inhabitants of these sites, as well as for visitors, if scientific and educational promotion actions were undertaken.

These landscape sites because of their geomorphological characteristics become all the more interesting when human action has participated in their construction. The irrigated Oulja of the Atlantic coast, the small irrigation perimeters between the strips of pediments and the pastures and Azibs of the summit parts of the Atlas, are undoubtedly as much linked to natural dynamics as to the action of man and his social organizations.

GEO-SCHOOL : A GEOPARK EDUCATION THROUGH OUTDOOR EXPLORATION OF JEJU ISLAND UNESCO GLOBAL GEOPARK

Aejin Lee, Tea-wanHan, Jung-goon Koh

World Heritage Headquarters, Jeju Special Self-Governing Province, Republic of Korea

Jeju Island is the largest volcanic island situated off the southern coast of the Korean Peninsula. The island was created by volcanic activity, which occurred between 1.8 million and 1,000 years ago. Because the original topographic features formed by volcanic activities are relatively well-preserved, it serves as a natural site to learn about volcanoes and to observe different phenomena. About 360 volcanoes and 170 lava tubes are distributed in Jeju Island, and it is a nature learning ground where you can observe various types of volcanic topography throughout the island. Beautiful Jeju Island has been designated as the UNESCO World Natural Heritage and the UNESCO Global Geopark in recognition of its academic, scenic, and geological values.

Jeju Island UNESCO Global Geopark operates a Geo-school education program for local residents to promote the value of the geosites and ignite the pride in local residents. Geo-school is an experiential field trip utilizing geoparks in order to pursue 'healthy risk' consisting of outdoor program and indoor theoretical classes and where participants are accompanied by geological experts and geopark interpreters to have directly experience research activities. Jeju Island Geopark operates differentiated programs reflecting the geological and topographical characteristics of different representative geosites, such as the lava tubes and volcanic cones. Through various indicators, the Geo-school education program has been identified as an effective educational program promoting interest in history, culture, and geology of geoparks and the local communities as well as to induce interest in basic science.

Thus, the Geo-School education program can be said as an exemplary model for the development of tourism-type experiential education using geopark.

THE EFFORTS TO GET A DESIGNATION AS A UNESCO GLOBAL GEOPARK

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Jeonbuk West Coast Geopark is located on the west coast of the Republic of Korea in a small town with a population of 10,800 people. The local governments of Buan-gun and the Gochang-gun manage Geopark in conjunction one to another. In 2015, we began our efforts to get Jeonbuk West Coast Geopark recognized as a UNESCO Global Geopark with the Geopark Project. Our goal was finally realized when UNESCO designated Jeonbuk West Coast as a Global Geopark this year. At this time, we would like to share our experiences that were gathered from working on the eight-year-long Geopark Project, as well as develop additional creative ideas about this kind of work. Our Geopark Project focused on increasing the visibility of Jeonbuk West Coast, as well as getting local residents interested in the Geopark concept. We visited local villages and schools to provide information on Geoparks, and we held discussions about what we could do together. The Geopark Project was not easy in the beginning. We encountered a lot of pushback due to the presence of a national park area in Buan-gun, in addition to strong feelings about conservation that were shared by the local residents. In response, we strived to correct any misunderstandings that these residents had about the purpose and concept of a Geopark. We also hosted special activities together with the residents, which helped to increase support for the project to get Jeonbuk West Coast Geopark designated as a UNESCO Global Geopark. As the community became more interested in the Geopark, residents were able to find ways to capitalize on Geopark, including creating things such as “geoguides” and “geoproducts”. Naturally, the community will continue to develop awareness about the protection and conservation of geological heritage. In this way, sustainable development can be better implemented in the Geopark.

**GYEONGBUK DONGHAEAN ASAN ASPIRING GEOPARK:
VALUES AND REASONS TO BE A GEOPARK**

Yun-su Lee^{*1}, Jung-hoon Kim², Yun-deuk Jang³ and Soo-Jae Lee⁴

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³*Department of Geology, Kyungpook National University*

⁴*Division for Natural Environment, Korea Environment Institute*

The Gyeongbuk Donghaean Geopark is located in the eastern part of the Republic of Korea, which is situated in East Asia. It shares boundaries with Pohang City, Gyeongju City, Yeongdeok County, and Uljin County, covering an area of 2,524 km² (land 2,261 km² + sea 263 km²). Currently, outdoor activities, accommodations, food and beverage establishments, crafts, and tour guiding services are emerging with the development of geotourism. The Geopark showcases diverse geological periods, including Paleoproterozoic, Paleozoic, Mesozoic, and Cenozoic. The geological diversity is contributed by various rock types, such as igneous, metamorphic, and sedimentary rocks. Five types of granitoid can be found within the Geopark, varying in age. The Permian granitoid and Triassic adakite within the Geopark hold particular significance as they offer valuable insights into the Permo-Triassic continental collision and the subduction of the Paleo-Asian oceanic plate. These rock formations provide important clues about the region's geological history and tectonic processes during that period. The Geopark is home to Paleogene and Neogene sedimentary rocks, which are rare in the Korean peninsula but can also be found in western Japan. These rocks hold international importance due to their unique characteristics, including paleomagnetic information, fossils, and complex fault systems. They contribute significantly to understanding the geological event of the opening of the East Sea (Sea of Japan). The Geopark is home to captivating geological features, including limestone caves, meandering gorges, tuffaceous cliffs, columnar joints, coastal terraces, dunes, and an unconformity with a time gap of 1.9 Ga. These remarkable features have been identified and listed as geological sites, with some of them designated as representative geosites due to their exceptional geological significance.

"GREEN CORNERS FOR RAIN", A PROJECT TO RESTORE THE PERMEABILITY AND GREENING OF SCHOOLYARDS

Stéphane LEGAL, Mariam MEDHI

Luberon Regional Nature Park – UNESCO Global Geopark, 60 place Jean-Jaurès – BP122 – 84404 Apt Cedex – France

The repeated climatic events of the last few years (strong heat waves, episodes of drought, intense rainfall...) have led local authorities to question the choices they make regarding the development of towns and villages: quality of the living environment, attractiveness of the territory, health, availability of water resources...

For this reason, the Luberon Geopark and its municipalities have been involved in the "Coins de verdure pour la pluie" ("Green corners for the rain") project to re-design some twenty schoolyards.

Some fifteen municipalities immediately expressed their interest in this action. For them, the project is an opportunity to experiment on a small scale with what could be reproduced elsewhere in public spaces (car parks, squares, roadsides, etc.).

Furthermore, its innovative nature in terms of adaptation to climate change, exemplary water management and taking into account the pedagogical and sociological uses of spaces, makes it an illustrative project contributing to the sustainable development goal "Climate action".

To date, 20 schoolyards in 14 municipalities have already changed their appearance thanks to the work carried out in summer 2022. The result? More permeable coverings than asphalt, but above all more natural: soil, sand, wood chips, rustic grassland, etc.

New facilities have also been set up to stimulate children's autonomy, creativity and experimentation, skills that are very useful for personal well-being. Thus, games, pathways, mounds, water games, wooden paths and planted huts are offered to the children to diversify the range of games and provide spaces adapted to each of their sensibilities.

The final result is visible, with the planting of trees, shrubs and ground cover plants which were the subject of gardening workshops with the pupils. Increasing the amount of vegetation helps to strengthen urban biodiversity while fostering the link between children and nature.

In these " schoolyards of tomorrow ", vegetation, permeable soils, the presence of water and shade structures create real islands of coolness... to the delight of the children and their teachers who will be able to use new educational spaces outside the school walls!

FOSSIL FOOTPRINTS IN THE LUBERON UNESCO GLOBAL GEOPARK: GEOCONSERVATION AND DEVELOPMENT OF THE SAIGNON SITE (VAUCLUSE, FRANCE)

Stéphane LEGAL, Pauline COSTER

Luberon Regional Nature Park – UNESCO Global Geopark, 60 place Jean-Jaurès – BP122 – 84404 Apt Cedex – France

Ichnosites represent a particularly rich and fragile geoheritage. They provide a source of information on the locomotion, behavior, anatomy, ecology, and evolution of extinct animals whose fossil remains have not been preserved. Footprints of Cenozoic mammals are rare. The Luberon Regional Nature Park, UNESCO Global Geopark, and management structure of the Luberon Geological Nature Reserve includes more than a dozen sites with footprints dating from the Oligocene.

The Saignon ichnosite, discovered in a quarry in the 1970s, has a very high density of footprints, with hundreds of mammal tracks and several dozen bird tracks. It is located in the Apt syncline (Vaucluse, France) in the Calcaires de la Fayette formation, dated from the early Oligocene. The site features various types of mammal footprints, with around 30 tracks of perissodactyls and artiodactyls.

A few years after its discovery, the site was covered with geotextile and sand to protect it from natural erosion and the growth of vegetation that was damaging the footprints slab. In 2019, the site was rediscovered, and a long-term conservation plan was drawn up. It includes 3D modeling of the site and tracks using photogrammetry, scientific study of the tracks, restoration, and the implementation of new in situ conservation measures compatible with public access.

A photovoltaic hall on a wooden framework will be built in 2024 to protect the slab. The surrounding area will be landscaped to welcome the public, provide interpretation of the site, and control access to the slab. This geoconservation project will both protect and enhance our geological heritage, while contributing to the transition to a low-carbon energy future.

MORE THAN JUST SDG 13: HOW THE UK UNESCO GLOBAL GEOPARKS ARE HELPING TO ADDRESS CLIMATE CHANGE THROUGH THE SUSTAINABLE DEVELOPMENT GOALS

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The UN Sustainable Development Goals (SDGs) were adopted in 2015 with the aim of improving peace and prosperity for people and for the planet. The SDGs are an ambitious set of goals that hope to end poverty, improve health and education, reduce inequality, and enhance economic growth, all whilst tackling climate change.

Out of the 17 SDGs, only one is specifically dedicated to climate change, SDG 13: Take urgent action to combat climate change and its impacts, more commonly referred to as SDG 13: Climate Action. Although this may seem minimal, the reality is that every single one of the SDGs should contribute to climate action, either directly or indirectly.

There are currently nine UNESCO Global Geoparks (UGGp) in the UK representing a wide geological diversity throughout the four regions. Each UGGp has a different management structure and governance arrangements but they all have the shared ethos of making their territories better places to live in, work in and visit.

The UK UGGps carried out a knowledge sharing exercise to assess the activities that are being delivered to address climate change. In some cases, these actions were planned to address climate change, but for most, they were co-benefits of other activities. These have all been framed in terms of the SDGs that they help to deliver, and the associated contribution to climate change mitigation and adaptation.

Some of the SDGs that have been contributed to include:

- SDG2 (Zero Hunger) by supporting resilient agricultural practices and increasing food security in the face of climate change.
- SDG 6 (Clean Water and Sanitation) by contributing to integrated water resources management and increasing water security in the face of climate change.
- SDG7 (Affordable and Clean Energy) by using renewable energy sources and contributing to climate change mitigation.
- SDG11 (Sustainable Cities and Communities) by supporting and developing sustainable transport networks and reducing greenhouse gas emissions.
- SDG12 (Responsible Consumption and Production) by developing sustainable tourism practices and reducing environmental impact of tourism.
- SDG15 (Life on Land) by restoring and enhancing terrestrial habitats leading to more resilient ecosystems.

By framing individual climate actions in terms of the wider 17 SDGs and not just within SDG13, the UK UGGps have been able to explore just how much of an impact they are having on delivering tangible climate change mitigation and adaptation measures. Consequently, by looking at the SDGs holistically, there is the opportunity to not just help to address climate change but to make a real difference to the lives and livelihoods of the people that live, work and visit their territories.

**STRENGTHENING GEOSCIENCE RESEARCH AND POPULARIZATION, BOOSTING GEOPARK
SUSTAINABLE DEVELOPMENT BY GEO-VILLAGE CONSTRUCTION**

Li Gengyu, Jing Zhixing

*Fangshan UNESCO Global Geopark Administration Department, Changgou Township, Fangshan District,
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Fangshan UNESCO Global Geopark of China, the first Global Geopark located in the capital city of a nation, and birthplace of Geopark Concept, has achieved great progress in terms of geo-heritage protection, geo-science research and popularization, and region sustainable development by geo-tourism.

The work of geo-science research and popularization was comparatively weak point of the Geopark in the past. In accordance with the GGN Guidelines and recommendation raised by GGN experts, we have carried out a wide variety of geo-science popularization materials and activities, developing multi-functional popularization site, information system, perfecting geo-science explanation panels, and establishing geo-village boosting visibility and reputation of the Geopark.

STUDY ON OPTIMIZATION OF TOURISM PRODUCT DEVELOPMENT BASED ON GEOPARK RESOURCES, CASE OF QINLING ZHONGNANSHAN UNESCO GLOBAL GEOPARK

LI Yue¹, WANG Chuang², YANG Jianping¹

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Endowed with abundant geological heritage sites, the Qinling Zhongnanshan UNESCO Global Geopark is an epitome of the Qinling orogeny. It is an important base for studying the geological history of the QOB, including evolution mechanics, plate subduction, collisional suture zones, mountain collapse-slides, glacial occurrence and the origin and evolution of humans. The Qinling Zhongnanshan Geopark comprises a number of geological heritage sites of global significance. It is also a mosaic of geological entities of special scientific importance, rare animals and plants, vestiges of *Homo erectus*, and fantastic religious cultures, forming a three-dimensional and multi-level landscape. With the development of tourism in Xi'an city, the Qinling Zhongnanshan Geopark has become a famous tourist destination with great attractions, a pillar industry for the local economy and a major part of the tourism industry in Shaanxi province.

By introducing the samples of tourism product in the Qinling Zhongnanshan Geopark, this paper describes the current situation of tourism development and intends to initiate further discussions and research on this issue to promote the sustainable use of tourism. The aim of tourism development is not only to widely promote the UNESCO Global Geopark brand, but also to empower local social and economic sustainability.

Key words: Qinling Zhongnanshan UNESCO Global Geopark, Tourism Product, Sustainable Tourism

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STUDY ON THE FORMATION AND EVOLUTION PROCESS OF DANXIA CAVES IN TAINING UNESCO GLOBAL GEOPARK, CHINA

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There are many palisades caves with different styles in Taining UNESCO Global Geopark in China (figure.1). But their approbatory reason has not been unified up to now, not to mentioned the cause for their suborbicular or tabular shape, which has restricted their protection and effective development. In the past, the reason for caves only focused on different weathering & erosion after the red sandstone strata explored on the earth's surface, which neglected two key points that the caves just developed in the sandstone strata and the reason analysis needed think about the characteristics and mechanism for sandstone diagenesis. Now is the key to the past. The Paleogene sandstone in Bohai Oilfield shows a great difference in diagenetic periods and physical property, while diagenetic mechanism is still unclear. Based on data from thin-section analysis, cathodoluminescence analysis, etc in Bohai Oilfield, we has been systematically studied the diagenetic characteristics and mechanism, main controlling factors of reservoir quality. On the basis of these results and data from geological analysis, studied research, annals etc in Taining UNESCO Global Geopark, it can be analyzed that the history of tectonic evolution, weathering & erosion in the red sandstone, and the situation of development (Figure.1) and protection in the caves. Then the formation mechanism and the distribution for the caves can be obtained, which can be used to more effectively develop and protect them than before.



Figure.1 The nested caves in Tianqiong Rock. Taining UNESCO Global Geopark

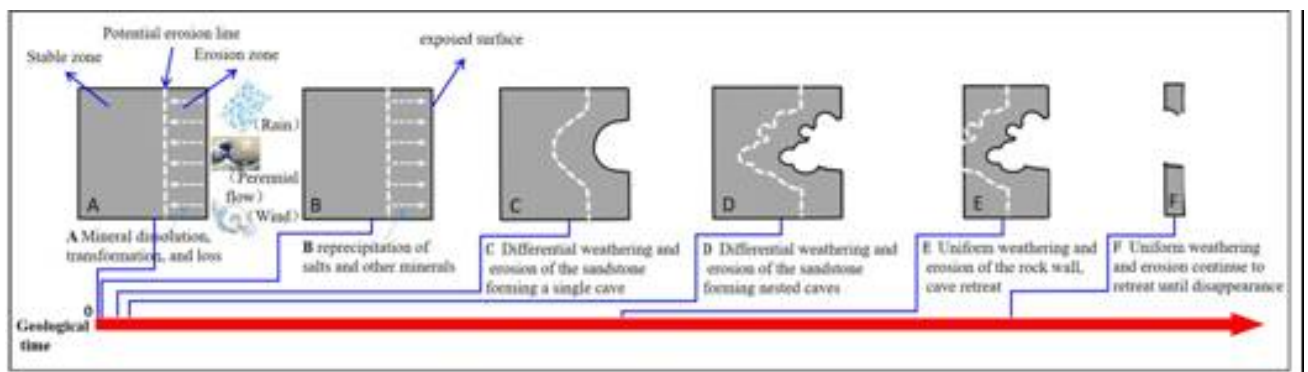


Figure.2 Evolution of nested caves in early-stage carbonate-cemented (oolitic cement) Danxia sandstone under the erosion of rainwater, river water, wind, salt, etc. (moist environment)

PONTA DA AJUDA, A NEW GEOSITE FOR THE AZORES UNESCO GLOBAL GEOPARK

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Being an institutional partner of the Azores UNESCO Global Geopark, the Municipality of Ribeira Grande (São Miguel Island), called for the Geopark's staff to cooperate with the interpretation of a new walking trail – "Fenais de Vera Cruz"- implemented by the Parish Council of Fenais da Ajuda in collaboration with the City Council.

During the field work, a new geosite was identified, Ponta da Ajuda with the largest outcrop of columnar jointing on the island, with more than 500 meters in length.

The local population has always appreciated this place, its peculiar outcrops, and the privileged spot to enjoy the sunset with a panoramic view to the north shore of the island, and erosion caves that can be explored by boat on calm sea days.

Ponta da Ajuda, the northernmost area of island features high and steep cliffs, presenting a sequence formed by:

i) a thick basaltic lava flow, at the base of the cliffs with columnar jointing, 30 to 40 meters high and over 500 meters long; this geological structure results from the contraction of rock material during the cooling and solidification processes of the lava, contracted causes the formation of fractures that are perpendicular to the cooling surface. This peculiar geological structure has very good visibility from the sea, as well as the caves and arches created by the erosion of the columns, which are continuously eroded by the sea. At the top of the columns, hexagonal polygons can be observed recalling the well-known Giants' Causeway in Northern Ireland;

ii) interspersed there are some pumice deposits from explosive eruptions, which occurred in the stratovolcanoes in the vicinity, and were brought by the wind or by pyroclastic flows and deposited here. In some areas it is possible to observe orange deposits, which result from the alteration of the pumice over time through the action of atmospheric agents;

iii) and at the top there is a more evolved lava flow (with compositions slightly richer in silica, sodium and potassium); on the eastern side of Ponta da Ajuda, weathered rocks associated with this lava flow can be observed, with rounded shapes and scales;

The parish council of Fenais da Ajuda valued the location with the trail inaugurated in December 2022, with a footbridge over Ponta da Ajuda, a swing to watch the sunset and a small viewpoint, to the west, to observe the basaltic columns.

During its analysis, the importance of this place as a geosite became obvious, being of scientific interest (discussion of the limit between the volcanic complexes of Furnas and Nordeste on the north coast of the island), educational/pedagogical (good example of columnar jointing, easily accessible) and geotourism (beautiful landscape and geological structure with interpretation and support infrastructures). The geosite was classified as a protected area of local interest in June 15th 2023, by the City Council of Ribeira Grande, in accordance with Article 31 of Regional Legislative Decree no. 15/2012/A, of 2 April. This new geosite integrates the process of revision and (re)assessment of the geological heritage inventory of the Azores UNESCO Global Geopark.

When we think we know our territory, the community surprises us by showing us a peculiar outcrop that they intend to value and promote, as a form of social and economic development of their rural parish. This is the true bottom-up essence of the Azores Geopark.

THE ACHIEVEMENTS OF LONGYAN ASPIRING GLOBAL GEOPARK

Wensheng Lin

Longyan aspiring Global Geopark is located in Longyan City, the western Fujian Province, the southeast of China. It covers an area of 2,175km², encompassing parts of the administrative regions of Xinluo District, Shanghang County and Liancheng County, with a total population of 312,000. It became a candidate for the UGGp in 2020.

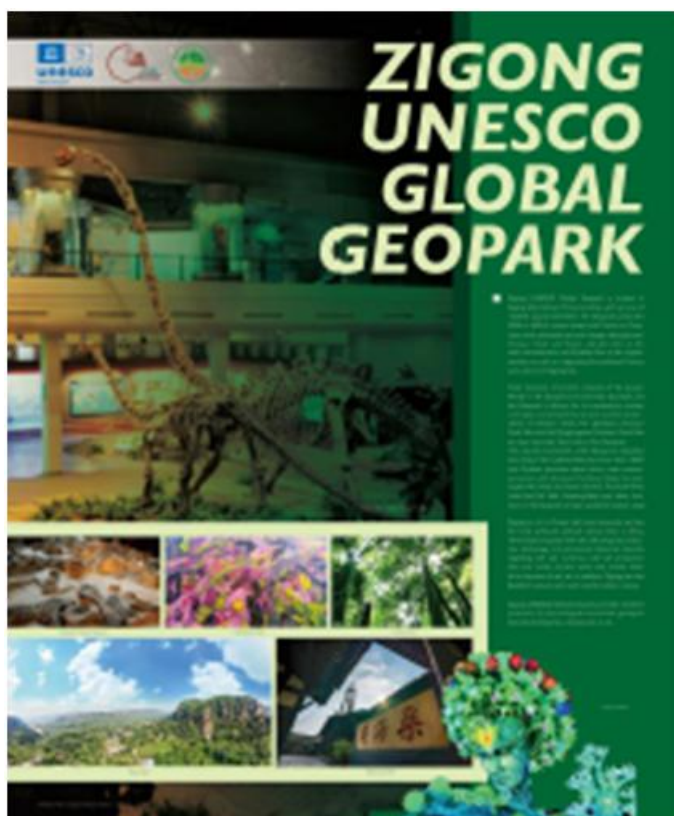
Longyan aspiring Global Geopark boasts abundant geo-heritage resources, featuring large-scale Meihuashan Granitic Complex, Guanzhaishan Danxia Landforms, Zijinshan Super-large Copper-Gold Deposit and Huanglianyu Quartzose Sandstone Landforms. It is also rich in biodiversity and cultural heritages. It is not only home to the precious animals and plants like south China tiger and *taxus chinensis*, but also the birthplace of Hakka culture, which was formed by the wisdom of the Hakka people's understanding of and blending into the nature, including ancient architecture of Hakka style like the Peitian Landscape Roundhouses and many intangible cultural heritages.

Since its application for the UGGp, Longyan aspiring Global Geopark, adhering to the concept of "celebrating earth heritage, sustaining local community", has been dedicated to the ten topics the UGGp concerns, especially making outstanding results in park construction, visibility, geoscience education, local community development, and networking, etc.

ZIGONG UNESCO GLOBAL GEOPARK

Lingling Wang

Zigong UNESCO Global Geopark is located in Zigong City, Sichuan Province, China, with an area of 1630.46 square kilometers. The Geopark joined the GGN in 2008. It covers strata from Triassic to Cretaceous that witnessed sea-land changes, taking Jurassic dinosaur fossils and Triassic well-salt relics as the main characteristics and Cyathea flora as the supplementary, as well as integrating the profound history and culture of Zigong City.



Fossil resources of ancient creatures of the Jurassic Period in the Geopark are extremely abundant, and the Geopark is famous for its tremendous number, rich types, concentrated burial, and excellent preservation of dinosaur fossils. The Dashanpu Dinosaur Fossil Site and the Qinglongshan Dinosaur Fossil Site are two important fossil sites of the Geopark.

The natural environment of the Geopark is beautiful and unique. The Cyathea Valley has more than 16000 wild *Cyathea spinulosa* plants, which were contemporaneous with dinosaurs. The Shisun Valley has landscapes like mesas and stone columns. The Yuexi River, Lede Red Soil field, Hualong Valley, and other locations in the Geopark all have wonderful nature views.

Zigong is rich in Triassic salt mine resources and has the most profound well-salt cultural relics in China. Here boasts exquisite well salt collecting and production technology, rich economical historical materials regarding well salt, numerous well salt production sites and scenes, ancient towns and streets which thrive because of salt, etc. In addition, Zigong also has Buddhist cultural relics and colorful lantern culture.

Zigong UNESCO Global Geopark provides excellent protection for the ecological environment, geological diversity, biodiversity, cultures, and so on.

3D TECHNOLOGIES AS A POWERFUL TOOL FOR THE DISSEMINATION AND ENHANCEMENT OF FOSSIL COLLECTIONS.

Elio Lippolis, *Department of Earth and Geoenvironmental Sciences, University of Bari Aldo Moro*

In the past few years, the adoption of digital technology and the utilization of 3D models have brought about a remarkable transformation in the realms of science, museums, and outreach. Digitization makes it possible to study and handle rare, too heavy, or too fragile specimens, or samples difficult to reach, which makes possible computer simulations and virtual restorations. Particularly interesting is the possibility of creating digital exhibitions and virtual museums. 3D models open up new scenarios, enabling a new and more engaging interaction between the object and the user. There are numerous techniques available for the process of digitization and the creation of 3D models. One method that particularly shines due to its user-friendly nature and cost-effectiveness is photogrammetry. The following project involves the 3D digitization, with photogrammetry techniques, of fossils studied for the first time by one of the greatest Apulian geoscientists: Arcangelo Scacchi (Gravina in Puglia, 1810 – Napoli, 1893), but resampled during the last research years. Scacchi is well known for his contribution to the fields of mineralogy and volcanology, but in his youth he was a paleontologist and published in 1835: "Notizie intorno alle conchiglie e agli zoofiti fossilidellevicinanze di Gravina in Puglia", in which he reported many fossils, mostly mollusks collected near the town of Gravina in Puglia (Southern Italy). Among the 170 mollusks species reported by Scacchi, 16 were described as new. The original Scacchi collection from Gravina in Puglia, which contained some rare type material, is housed in the Museum of Paleontology of the University of Naples "Federico II", but some of the original material was lost. A modern still on-going study on the fossil mollusks from Gravina in Puglia, allowed to found numerous taxa and some rare type material. A new collection that also includes precious type material, is now available and ready to be exposed. In this case, it holds significant importance to digitize these fossils for both preservation and enhancement purposes. Furthermore, digitization serves as a means to effectively disseminate Scacchi's malacological work, reaching a vast audience. 3D models have proven to be a valuable tool for museum education and outreach; the idea is to use this powerful tool to introduce the work of Scacchi and the fossils he studied to younger generations, taking advantage of the possibility of visualization on tablets, PCs and smartphones or with VR headsets, as well as the option of 3D printing, making the process of science education more immediate, fun, and accessible to everyone.

POGGIORSINI : A SMALL GEM IN THE ALTA MURGIA NATIONAL PARK

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Department of Earth and Geoenvironmental Sciences, University of Bari Aldo Moro

Several arguments can be used as keys to introduce the geological culture in eco-friendly tours. In the Murge area (Puglia, southern Italy), Poggiorsini, the smallest town in the Alta Murgia National Park, located halfway between “Castel del Monte” and “Matera”, two sites included in the World Heritage List of UNESCO, could represent an interesting starting point for geotouristic routes in one of the little known, but geologically interesting, internal areas of Italy. Crossing the Murge area, it's possible to introduce geotourists or school groups into the geological history and into the different paleoenvironments of the area, starting from the origin and nature of outcropping rocks. The latter, exclusively sedimentary and mainly carbonate in origin can be used for a “reading” of three ancient and different outcropping carbonate successions, each of them linked to different palaeoenvironments: the Cretaceous intertropical platform succession, the Oligocene lacustrine succession, the lower Pleistocene temperate sea succession. The “oldest” succession is represented by a Cretaceous carbonate succession that derives from the aggradation, in warm and shallow marine environments, of fine-grained particles whose accumulation built up the Apulia Carbonate Platform. During the Cretaceous, the Earth was a different world from the one we live in today and was characterized by warmer climate, by a different distribution of lands and seas (palaeogeography), higher sea level and by different biological community developed up to that time. This history is recorded in the Murge's rocks in which abound fossils of rudists, marine fossil bivalves that dominated the Cretaceous seas, before became worldwide extinct at the end of the Cretaceous. The same succession sometimes contains several surfaces with tetrapod tracks (i.e. the Altamura surface at the bottom of the Pontrelli quarry). On one of the rocky limestone spurs of the area it stands out, in all its beauty, the Archaeological site of Rocca del Garagnone, a Medieval Castle ruins, partially destroyed in 1731 by an earthquake. It's possible to compare this succession with modern “analogous” region (e.g., the Bahamas), despite the great temporal distance between the Cretaceous and modern times. At the end of Cretaceous the Apulia Platform became an exposed region and a karst lake system developed in the depressed areas, as witnessed by the Calcareus lacustrine succession, that contain fossil of *Planorbis* and *Limnaea*, (typical gastropods of continental lakes) deposited several millions of years after the Cretaceous rocks; a good exercise is trying to compare this succession with the analogous of present day. During the Pliocene the return of the sea onto the carbonate rocks, exposed since the end of the Cretaceous is attest by the Pleistocene succession, that represent carbonate systems developed along the flanks of ancient islands and contain fossils of molluscs, brachiopods and echinids. This rocks succession is well known in the area for having been the bedrock of rupestrian towns like “Grotte nelle locality” where rock settlements testify the presence of man for thousands of years, from Neolithic to Middle Age. It's possible, with a little effort, compare this succession with present-day Mediterranean environments around Greek or Dalmatian archipelagos.

IMPROVING THE VISITATION OF THE GEOHERITAGE CLASSIFIED BY UNESCO: A PROJECT OF THE ESTRELA UGGP

Fábio Loureiro*, Emanuel de Castro

Estrela UGGp

The preservation and valorization of the Geoheritage of a UNESCO Global Geopark is one of the main pillars from the everyday work of these territories. Through its geosites, a Geopark can help create a better understanding towards the main process that shaped planet Earth throughout millions of years. In the case of the Estrela UNESCO Global Geopark (Estrela UGGp), its rocks and landforms help tell the story of ancient oceans, large mountain chains, planation surfaces and glaciers that shaped the higher sectors of the Estrela Mountain, these last originating landforms that contributed to its designation as a UNESCO Global Geopark.

In light of the above, it is important that a Geoconservation strategy focuses both on the preservation and conservation of Geoheritage, but also on the implementation of actions towards its promotion, as it represents an important touristic and educational asset that helps create more aware societies. With this notion, within the actions planned for the Geoconservation strategy of the Estrela UGGp, one of the most relevant projects in implementation is the "Improving the Visitation of the Geoheritage classified by UNESCO".

The Estrela UGGp has in its area a natural park, the Serra da Estrela Natural Park (SENP), that occupies 40% of the territory. As of this year, 2023, there was funding of the Portuguese government towards the implementation of actions to value the natural heritage of the Portuguese protected areas. Through an application and consequent evaluation, the project "Improving the Visitation of the Geoheritage classified by UNESCO" was one of the selected to be implemented in the area of the SENP. It intends to endow the territory with new structures that provide, the dissemination of scientific knowledge, the valorisation of the natural heritage and environmental awareness, but also a greater control of the access to the geosites, reducing the impact of visits on Geoheritage surrounding habitats. At the same time, this project can also be an important contribution to the creation of a differentiated tourist offer, that through new tourist products encourages the demand for new geosites, reducing the pressure on the already most visited areas, which, in the case of the SENP, coincide with the most sensitive habitats.

Under this project, various interventions are proposed in eight geosites of the Estrela UGGp that are situated with the area of PNSE: Penha de Pradostor (Celorico da Beira), Cortes fluvial valley (Covilhã), Mondego pothole and Mondeguinho Spring (Gouveia), Metasediments of Quinta da Taberna and Serra de Bois tin and wolfram Mines (Guarda), Poço do Inferno (Manteigas) and Cabeço de Santo Estevão viewpoint (Seia). For each of them, as specific actions to be implemented, we highlight: i) the implementation of new pedestrian routes; ii) the creation of new viewpoints with infrastructures to accommodate the visitants; iii) the implementation of electronic visitor counters to monitor the carrying capacity of the locations.

In the end, this project represents one more action that is contributing to the preservation and valorisation of the Geoheritage of the Estrela UGGp, asserting the natural heritage of this territory as a tool to boost the tourism and educational activities, making it a territory to learn and enjoy.

THE INTERNATIONAL GEOPARK CAMP FOR YOUTH: A REVISION AND IMPLEMENTATION OF CURRENT METHODS OF EDUCATION FOR SUSTAINABLE DEVELOPMENT

Kersten Löwen

UNESCO Global Geopark Muskauer Faltenbogen / Luk Mużakowa (Muskau Arch)

The International Geopark Camp for Youth (IGC) is a biennial educational offer of the German-Polish UNESCO Global Geopark Muskauer Faltenbogen / Luk Mużakowa, internationally known as Muskau Arch. It was launched in 2014 with participants from the Czech Republic, Hungary, Germany, and Poland. Groups of young people were invited to a one-week stay in a youth recreation centre and dived into the unique glacial history and geology of the Muskau Arch on field trips and learned about its wealth of raw materials, the craftsmanship and processing industry that developed from them in numerous practical workshops. In this way, the students were introduced to the history of the region in a playful and artistic way, but also were introduced to the geological conditions that were the basis for this development. The program was rounded off by a wide range of interpersonal activities, during which the international participants were able to get to know each other's culinary and cultural specialties.

Since the successful start of the project under the title 'Art meets Geology', the IGC has been held with slight modifications two more times under the mottos 'Craft meets geology' and 'Energy meets Geology' in 2016 and 2018, respectively. Only minor changes were made to consider the language barrier and to allow the participants to get to know each other better.

Due to the strict Corona restrictions, the 2020 project was postponed for two years. However, the forced break did not remain unused, but the project was adapted to today's circumstances and urgent ecological challenges in a sustainable way. Thus, the IGC could take place once again in 2022 under the motto 'Geology meets geological witnesses of climate change'. A major innovation was the small but very informative research project that preceded the IGC for a duration of 9-12 months. During that time, the youth group, a supervising teacher, and a scientific supervisor from a local geopark did their own research on 'witnesses of climate change' and how this topic can be applied to a local geopark in their region.

Within the framework of a long workshop of all UNESCO Global Geoparks in Germany together with the Alfred-Toepfer-Academy for Nature Conservation, the programme was further developed with regard to current ESD concepts and sustainable development goals. The presentation will give an overview of the new structure and new ideas we have prepared. Since the next IGC will take in August 2024 I will present the first Call and would like to encourage our Global Geopark partners to apply for participation.

**A SURVEY OF GEOSITES AND HUMAN LANDSCAPES IN
LEIQIONG UNESCO GLOBAL GEOPARK OF CHINA**

Lu Chunyu

In order to promote the sustainable economic development of Leiqiong UNESCO Global Geopark, a survey of geosites and human landscapes have been carried out in the region. The survey encompassed a total of 87 geosites, which included 54 newly discovered sites, along with 54 sites of natural and human landscapes. Through investigation, analysis, and comparison, the number and type of geosites in Leiqiong have been significantly supplemented. The basic information such as the distribution location, preservation status and characteristic parameters of geosites have been greatly enriched. The genesis, development and changes of the geosites have been better acquired. Geosites are more fully integrated with natural and humanistic elements. The scientific and aesthetic value of geosite resources have been further enhanced. The survey results will provide valuable basic information for geological science popularization, geosite protection and tourism development of Leiqiong.

SCIENCE POPULARIZATION EDUCATION IN YANDANGSHAN UGGP

QINFEI LU, YANDANGSHAN UNESCO GLOBAL GEOPARK OF CHINA

Lu Qinfei

Yandangshan had jointly organized the APGN Week and the World Earth Day From 2020 to 2023, with other global geoparks such as Danxiashan, Yimengshan. Events such as the 1st World Earth Day called 'Friendly Sister Park Mutual Exhibition and Interaction' and the 6th 'The Most Beautiful Earth-marks' were organized which comprised both online and onsite science popularization activities, summer study tour, National Science Popularization Day and International Geodiversity Day activities. Workshops, photography exhibition, quiz contest and geopark visits on geodiversity appreciation and geoparks were organized. These activities provided free admission to teachers and students across the country during summer vacation. Popularization of geoheritage protection and geopark was conducted with nearly 10,000 tickets and over 20,000 popular science books and traditional Chinese medicine sachets were given to the participants as gifts. Yandangshan worked with CCTV in producing the seven episodes of 'Exploring Yandangshan' as its science popularization series of 'Follow the Books to Travel'. It followed the route of ancient traveler Xu Xiake to visit Yandangshan (upper and lower) and study its fantastic landscape and unfold the stories of the ancient volcanoes. These stories were told to the audiences through camera. The geopark had strengthened the research on 'Yandangshan landscape' jointly with the Institute of Geology of the Chinese Academy of Geological Sciences, University of Chinese Academy of Sciences, Zhejiang University, Beijing University of Science and Technology, Institute of Geology of the China Earthquake Administration, and Nanjing Geological Survey of Chinese Geological Survey. The center and other scientific research institutions had carried out three phases of field study. Detailed investigation and sampling had been carried to study its phenomena, distribution and formation, resulting in acquiring large amount of first-hand information and new discoveries. They were important to the protection of the geological heritages of Yandangshan Global Geopark.

THE LANDSCAPE OF THE TERRACED FIELDS AND DRY STONE HUTS IN THE MAIELLAGEOPARK

Di Martino Luciano^{1,2}, Monaco Maurizio¹, Violetta De Luca^{1,2}

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The landscape of the Majella National Park is characterized by extraordinary representations of the daily life of local populations, whose activities have been shaping valleys, grasslands, summits, and woods for thousands of years, with the goal of obtaining a livelihood in a delicate and correct balance with natural elements.

Drystone huts and walls, the result of archaic, simple building techniques, highlight the concept of environmental sustainability, leaving no waste whatsoever.

The landscape of the terraced fields and dry stone huts is the maximum expression of the biological domestication of the mountain, a process underway since the Neolithic. During the last 50 years or so, abandonment of sheep farming and agriculture has led to significant and rapid changes in the semi-natural landscape created over the centuries.

These biological and cultural changes must be analysed in order to implement appropriate measures to conserve biodiversity at species, habitat and landscape level.

The dry stone architecture characteristic of the north-eastern side of the Majella massif is clear evidence of the enormous efforts made to clear the land of stones during the last two centuries to grow crops on land formerly used as pasture for the flocks. The move up the mountains began in the early 19th century following the crisis in transhumant sheep farming, combined with a demographic boom and abolition of the feudal system, leading to parcelization of land previously owned by the nobility, the church and the state. The hunger for land drove the new settlers to cultivate slopes where just a thin sward covered a sea of stones.

The reward of the collective, meticulous commitment, by many dedicated to this cause, came on November 28th, 2018 when UNESCO officially included the art of drystone construction, its knowledge and techniques, in the list of intangible human heritage, thus bringing the world's attention to a construction technique which has long been able to admirably hold together both environmental and cultural aspects, giving life to artefacts which speak the local language of the places where they were built, imbuing their forms with natural harmony.

The newborn Majella UNESCO Global Geopark (April 22, 2021) hosts more than one hundred mapped dry stoneteraces, some of which represent important geosites and tourist attractions.

Over the years, the agro-pastoral dry stone "villages", huts and walls in the Majella have been the subject of a programme of measures to restore and maintain sites of particular interest and create a "Dry Stone Huts Trail" (identified with the initials CP on the Park's Footpath Map). In particular, the Park's Volunteers have helped restore a number of Abruzzo's most important sites.

With this program, the signposting was carried out, the creation of a specific app for the Path of Dry Stone Huts and the purchase of an agro-pastoral "village" for educational purposes and tourist attraction. Now work is underway on the restoration of terraced fields for the cultivation of local varieties of cereals to be recovered, through the creation and implementation of training courses for dry stone operators.

Together with other activities already completed, the Park thus aims to improve one of the Majella's characteristic features, on a par with the rock churches and hermitages, to offer visitors new attractions and invite them to explore the proposed itineraries steeped in history and human memory.

AGRI-FOOD TOURISM BUSINESS MODEL IN NOVIATION OF MANGROVE FOREST ECOSYSTEM IN THE BELITONG UNESCO GLOBAL GEOPARK, INDONESIA

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The Belitong UNESCO Global Geopark (Belitong UGG) has more than a century-old mangrove species in the granite mangrove forests, Kuale Geosite. Another mangrove forest in the Belitong UGG area is the Gunung Kubing Geosite. This geosite is a community area based on natural and mangrove forests as a local food source. Wild honey is one type of local food from the natural forest used by the local community. For decades, the local community has made forest honey harvesting part of their livelihood. Applied particular and unique technic, the harvesters of Belitung island have treasured indigenous ecological knowledge (Cesard, 2022). In addition, the local communities utilize brackish crabs from the mangrove forest for self-consumption and trade to the other island. As geosites based on mangrove forest ecosystems, tourism development in these two geosites are still focused on offering their characteristics. For example, the Kuale geosite offers mangrove tours, and the Gunung Kubing geosite offers forest tours and forest honey harvesting tours even though there are also mangrove forest areas. These geosites have not yet integrated the tourism development of mangrove forest ecosystems between good natural scenery and available local food. These various potentials show that Belitong UGG needs to develop the business model innovation of agri-food tourism. Creating the agri-food tourism business in the geopark area is a strategy to add value to the geological heritage and local communities, promote the creative economy to generate jobs, and emphasize the authenticity of products, producers, and restaurants within the geopark. Liu et al. (2017) stated that agri-food tourism is an eco-innovation strategy. This study uses a descriptive qualitative design that systematically analyzes and evaluates the agri-food tourism business model of the mangrove forest area in the Belitong UGG. This survey involved farmers, tourists, the Indonesian tourism association, geopark managers, and the Government of Belitong Regency (the tourism and creative economy service). This study adopted the nine elements of the business model canvas and four elements of the value innovation. The result of this study is value innovation for the agri-food tourism business model consists of eliminating brackish crabs trading and its network. The Agri-food tourism business also reduces the local food price. In addition, the agri-food tourism business raises the attractive packaging and certified product, establishes a collaboration in the value chain, raises the forest honey price, utilizes the Sunggawan as local community intellectual property, collaborates with the educational institution, and provides safety tools. Furthermore, agri-food tourism businesses create complete packages and activities

HIDDEN ELF AND GOBLIN STORIES ALONGSIDE WORLD-CLASS ARCHITECTURE THE INTANGIBLE AND TANGIBLE HERITAGE OF THE IMPACT CRATER LAKE GEOPARK AREA IN FINLAND

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Lake Lappajärvi is Europe's largest meteorite impact crater lake, which was formed 78 million years ago by a meteor impact. An asteroid of about 1 km in diameter collided in an area between Mars and Jupiter and was thrown out of orbit, ultimately hitting the Earth with a velocity of 17 km/s (60,000 km/h). The collision and the vast explosion vaporized the H-chondrite meteorite itself and created a 750m deep and 22 kms wide crater.

The unique nature of the Impact Crater Lake, the forests, the clean air, the diverse activities, the experiences, and encounters with the local people are the main reasons for tourists to want to spend their holidays in the area known as the Impact Crater Lake Geopark. The aforementioned tourist attractions also attract international visitors.

The stories start from the Stone Age, when the first people settled in the Geopark area after the Ice Age about 9500 years ago. They settled in Nykälänniemi, located in the northern part of Lappajärvi, and on a small island, Kyrönsaari, that is only 100x200 meters in size. An accessible nature trail has been built on the island, along which one can explore the Stone Age settlement and the five earth pits that represent the early sauna culture. The sauna elf, Sudatorium Alfus, will take visitors on an adventure on the island.

Peikkoluola "goblin cave" is located on the southeastern shore of the Impact Crater Lake, right on the border of Alajärvi and Vimpeli. The area which is also on a crater rim, is a wonderful, cultural-historical site. The goblin has lived in that place with the owners and some of the local people for 4000 years, and it has no intention of moving away! It is possible to go on excursions and explore the caves in the area, e.g. by hiking the Lakeaharju-Pyhävuori trail.

The area of the Impact Crater Lake Geopark is also a dream destination for people who are interested in architecture and buildings designed by the world-famous architect and designer Alvar Aalto. In Alajärvi, one can go on a guided tour and admire some of Alvar Aalto's most significant designs. During the tour, visitors will hear fascinating stories and facts about Aalto's life, architecture, and the history of Alajärvi. The tour will take visitors to some of the local architectural gems. In Alajärvi, one can see buildings from different stages of Aalto's career, from his earliest assignments to his last. There are 11 buildings in total in the Alajärvi Administrative and Cultural Centre.

The Impact Crater Lake has a natural, tangible, and intangible heritage that must be cherished. In Alvar Aalto's words: "This place is my spiritual home"

HOW TO ESTABLISH A WIN-WIN SITUATION IN COOPERATION – EXPERIENCES BETWEEN JAPAN AND THE IMPACT CRATER LAKE GEOPARK AREA IN FINLAND

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The Impact Crater Lake Geopark has been in operation for almost 7 years now. Right from the start, it was decided that we would aim to learn from other geoparks and hear about their best practices. In addition to the European Geoparks, we were also interested in Japan because we had already established some connections there.

Lake Lappajärvi is Europe's largest meteorite impact crater lake, which was formed 78 million years ago by a meteor impact. An asteroid of about 1 km in diameter collided in an area between Mars and Jupiter and was thrown out of orbit, ultimately hitting the Earth with a velocity of 17 kms/s (60.000 km/h). The collision and the vast explosion vaporized the H-chondrite meteorite itself and created a 750 m deep and 22 kms wide crater.

The unique nature of the Impact Crater Lake, the forests, the clean air, the diverse activities, the experiences, and encounters with the local people are the main reasons for tourists to want to spend their holidays in the area known as the Impact Crater Lake Geopark. The aforementioned tourist attractions also attract international visitors.

The basis of the cooperation is the idea that both areas can respect their own heritage and their own ways of doing things. Both partners should be equal, but they would have their own strengths that could be shared with each other. Finnish and Japanese cultures have their own special features, and at first they might seem very different from each other. However, the basic values are the same in both countries; everyone's right to express their opinion, rectitude, honesty, trustworthiness, and loyalty are important.

The goal of the collaboration with a Japanese Geopark is to create structures:

- Exportation and importation: the goal is to create at least one twin city agreement with Japan. The agreements will make it easier to create an import/export platform for the regions, which guarantees an increase in regional exports.
- Cooperation in student training. Agreements will be created with Japan, which will facilitate the students' migration to the Impact Crater Lake Geopark area, and at a later stage enable their employment and integration into the region.
- Utilising the agreements to help promote tourism of the Impact Crater Lake Geopark in Japan.

The first agreement was made with Chichibu Geopark in Saitama Prefecture.

Key words: win-win collaboration, geoparks, Japan, Impact Crater Lake Geopark, business, tourism, education

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**ASTEROID AND IMPACTITE RESEARCH ACADEMY – A NEW TOOL FOR EDUCATION IN THE
IMPACT CRATER LAKE GEOPARK AREA, FINLAND**

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Lake Lappajärvi is Europe's largest meteorite impact crater lake, which was formed 78 million years ago by a meteor impact. An asteroid of about 1 km in diameter collided in an area between Mars and Jupiter and was thrown out of orbit, ultimately hitting the Earth with a velocity of 17 km/s (60,000 km/h). The collision and the vast explosion vaporized the H-chondrite meteorite itself and created a 750 m deep and 22 kms wide crater in the about 2 billion years old bedrock, vaporizing, melting and impact metamorphing all rocks and minerals in a temperature of more than 3,000 degrees Celsius. Kärnäite is the most unique rock type consisting of 2-3% minerals from outer space, mainly the platinum group elements.

The area of the Impact Crater Lake Geopark is a dream destination for people interested in geology. The area offers perfect conditions for those who are interested in exploring the unique environment. The Impact Crater Lake has a natural heritage that must be cherished. The infrastructure must be constructed in a way that educational institutions and companies in the area can benefit from the unique heritage. It means developing services for visitors that offer guided tours and opportunities to explore local rarities and to participate in local research studies.

By combining the already existing skills and knowledge of the locals and increasing the cooperation between the public and the private sectors in the Geopark area (4 municipalities) we have been able to build the Asteroid and Impactite Research Academy that operates on an international scale. The Asteroid and Impactite Research Foundation is a research center that supports and promotes children and young people's knowledge of science and technology, as well as education and development through research projects and networking.

The Research Academy is equipped with high-quality polarizing microscopes, stereomicroscopes, a high-quality 300mm telescope and well-organized laboratories that can be used for quantitative and qualitative studies. All basic tools needed for field work and laboratory work are available for students, researchers, and visitors. The Research Academy organizes public lectures, events, and courses for schools and offers fieldwork opportunities for students studying at the University of Helsinki.

VALORISATION OF THE PALEONTOLOGICAL HERITAGE OF GARGALLO, MAESTRAZGO CULTURAL PARK, UNESCO GLOBAL GEOPARK, TERUEL, SPAIN

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Gargallo is one of the 43 municipalities of the Maestrazgo Cultural Park, UNESCO Global Geopark (UGGp). This Geopark is characterized by a large and varied number of rock formations and an outdoor laboratory for exploring the geological evolution of the Iberian Range during the Mesozoic and Cenozoic. A distinct geological feature of this territory is its richness of fossil sites including dinosaurs. Dinosaur remains have been found since the mid-XXth century and enabled to establish *Aragosaurus ischiaticus* (Sanz et al., 1987) as the first new Spanish dinosaur. Moreover the first new Spanish mesozoic turtle *Trachyapsis turbulensis* (Bergounioux, 1957) was described thanks to fossils unearthed within a mine in Gargallo.

Since 2021 some initiatives have been developed for valorization of the paleontological heritage of Gargallo. Among the actions carried out, a renewal outdoor welcome panel was updated to expose the Geoparks project. There was also an exhibition consisting of large panels with information for all audiences. The exhibition introduces the relationship between Gargallo, the coal and its geological/palaeontological heritage. It also shows a representation of the most characteristic rocks, minerals and fossils of the municipality and a replica of the holotype of the Gargallo turtle (*Trachyapsis*).

On the other hand, a Geological Route from Gargallo to La Pintada Mine (integrated in the network of tourist trails of Aragón) was designed and implemented, offering the opportunity to discover the most representative geological and natural elements of the area. The route allows to “dive” into a Cretaceous sea to take a journey through geological time to discover the Gargallo turtle mine via 9 stops on a circular route of 6.9 km.

Thanks to these initiatives, Gargallo has been the setting for the Meeting of the Spanish Geoparks Forum in the framework of the V Open Days of the Spanish Geoparks Forum (2021), different guided visits to the exhibition and the geological route organized by Andorra-Sierra de Arcos “Comarca” (2022), a Meeting of the Maestrazgo UGGp Scientific Committee (2023) as well as various activities for the dissemination of the geological heritage.



THE ROLE OF AGRICULTURAL PRODUCTION SYSTEM FOR LOCAL SUSTAINABILITY IN THE AROUCA UNESCO GLOBAL GEOPARK (PORTUGAL)

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The UNESCO Global Geoparks (UGGps) are territories that promotes strategic territorial management integrating the society, economy and environment to reach sustainability in a balanced way.

The UGGps are focused on stimulating economic activity within the framework of sustainable development through management plans, which promotes the preservation of the environment and respect of the cultural identity. They work through strategic objectives, among which we find socioeconomic development.

In this context, the Agricultural Production Systems (APS) within the UGGps are a fundamental piece to achieve these objectives, but they have gone through different evolutions, causing different degrees of performance.

There are different tools dedicated to value and assess the characteristics of UGGps in sustainability processes, such as Impact Assessment (IA) and Strategic Environmental Assessment (SEA), reported in the Geopark Management Toolkit. However, most of these diagnoses have been dedicated to identifying general development compliance, without considering the particularities of the new interactions between the components, actors and external relations. This could be a limiting factor in the modification of the evaluation results, particularly regarding the agricultural productive sector and their involvement with the UGGp management structure.

Understanding the dynamics of the APS in the AroucaUGGp (Portugal), as well as identifying those actors and non-formal institutions that participate, can contribute to improving the management regarding the sustainable patterns of consumption and production, which implies contributing directly to Sustainable Development Goal 12 of the 2030 Agenda.

By modeling the APS and their interaction within the UGGps, the performance of the Ecosystem Services was characterized, as well as their contribution to local sustainable development. In this sense, the role developed by the actors of the APS in local sustainability was identified, considering the cultural influence, as well as the social, economic, and environmental context when choosing the techniques and products implemented. This makes it possible to understand the production chain and processes in all its phases to identify optimization opportunities.

The contribution of this project resulted in a simplified model that identifies the relationships and influence/dependence between the internal and external factors that make up the APS and its involvement in sustainable development. This procedure proved to be essential for understanding local management and the intervention of the UGGps' management structures at the level of the agricultural production sector and the distribution and consumption of products.

4GEON PROJECT AS A TOOL FOR SHARING PLAYFUL GEOSCIENCE KNOWLEDGE

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The IGCP-751 4GEON project launched in 2022 connects five diverse geoparks (The Barrandian National Geopark; Rio Coco UNESCO Global Geopark (UGGp); Colca y Volcanes de Andagua UGGp; Ngorongoro Lengai UGGp and Bohol Island UGGp) defined by its own history, geological and geomorphological phenomena, culture and local community. The most important event of the project was the Eastern Partnership conference and workshops, which took place in Příbram, Czechia, between August 29 and September 7, 2022. In several places in the Czech Republic (Barrandian National Geopark, Bohemian Paradise UGGp, etc.), project participants became familiar with the Czech concepts of geoscience research, Earth heritage interpretation, the use of virtual reality, the geoschool, mining tourism, paleontological sites, and geotourism products as well as with experiences from other geoparks and protected areas of the Eastern Partnership countries.

As the first planned output of the project, Barrandian National Geopark launched a geoportal (<https://www.geodeugame.com/en/>), several online workshops were also held, a project portal was created (<https://www.4geon.org>) and the project was intensively promoted among local residents and regional administrations by all involved geoparks. During the first year of the project implementation, several diverse activities were implemented, briefly described in the article "Report of 4GEON: A Project of Four Continents Connected Through Playful Geoeducation". In 2023, an online workshop was held, micro-projects are being created at partner geoparks in Nicaragua, Peru, Tanzania, and the Philippines and opportunities for financing them are being sought, geoeducation is being carried out, and feedback shared, a page was created promoting the project and all the geoparks involved in it on Pinterest (<https://cz.pinterest.com/4geon/>) and another project meeting of representatives of all involved geoparks is planned at the University of Hradec Králové and Barrandian National Geopark at the turn of September and October. At this meeting, it is planned, among other things, to familiarize the participants with the way of working on joint projects of the geoportal, the web portal of the project, Pinterest, and the use of other social media. Specific activities will be agreed which will lead to the further development of geoschools, geobus/geoship, and interpretation of Earth's heritage.

UPDATE PROGRAM FOR INTERPRETIVE EQUIPMENT IN GEOPARKS

Martinez Jose A.

One of the main objectives of a geopark in its initial stages, as a candidate for the GGN, is the promotion of its heritage, especially the geological one, through the installation of interpretive panels in the main geosites with the aim of making them known both among the local population and among the visitors. Traditionally, these are printed displays installed on metal or wooden structures. With the passage of time, in certain places, where there are various elements to be promoted, multiple displays are concentrated that make it difficult to understand the heritage elements. This is more pronounced in geoparks whose management involves more than one administration. Additionally, inclement weather causes the signs to deteriorate over time and require considerable investment for their maintenance.

These problems sometimes lead to the appearance of an excessive number of panels in a poor state of conservation in one of the main geosites of the geoparks or in downtown, producing a negative visual impact.

New technologies offer a solution to these problems by the possibility of offering the interpretive contents digitally, for their reproduction on mobile supports accessible through the Internet.

This has multiple benefits:

- Reduction in the number of physical supports, by being able to include links to the contents through QR codes, centralized in appropriate places
- Null physical deterioration over time
- Unlimited space for content presentation, including its translation into different languages.
- Reduction of the costs of updating the contents
- Possibility of offering content adapted for disabled people.
- Possibility of disseminating the contents through the social networks for the promotion of the Geopark heritage.

Molina Alto Tajo UGGp works on the transformation to digital support of several of its interpretive equipment such as:

- Geo-routes brochures
- Installation of touch screens instead of traditional displays.
- Adaptation of the road book of cycling and hiking routes to interactive digital support.
- Simplified displays with the inclusion of QR code-type links for downloading interpretive content.

AN ORIGINAL, HANDCRAFTED CERAMIC CUP THAT HIGHLIGHTS THE IMMATERIAL HERITAGE OF THE POTTERS OF THE NORMANDY-MAINE ASPIRING GEOPARK

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3. *Ceramist*

The Normandy-Maine Aspiring Unesco Global Geopark territory reveals a long geological history of 600 million years. In order to share this heritage with as many people as possible, the Park and Geopark has joined forces with various local stakeholders to create geoproducts that combine local development, heritage enhancement and local know-how promotion.

In the Mortainais-Domfrontais area (west side of the Geopark), the geological heritage has contributed to the rise of an ancestral know-how of potters. Indeed, the presence of a clay with exceptional properties has attracted many potters in the 15th century, developing a specific expertise and collections of objects in this area which is internationally recognized. This resource is no longer exploited and the exploitation site is now a protected geosite, but the activity of ceramists continues.

This cultural and immaterial heritage is highlighted by the creation of an original and handcrafted cups collection. Produced in limited edition by Alexandre DAULL and Laure RECULÉ, they are handcrafted in the workshops of the Ceramic Museum of Ger- creation centre, a Geopark's partner site. This new geoproduct contributes to the local development and the influence of the Geopark. These cups are on sale at the Park and Geopark Visitor Centre and at the Poiré Museum. They will soon be on sale in the other partner sites of the Geopark.

GEPARKS – CONSERVATION AND VALORISATION OF GEOLOGICAL HERITAGE SITES TITLE: THERE WAS ALSO LAVA HERE: THE 25 MA VOLCANISM IN THE SERIDÓUGGP

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The Seridó UNESCO Global Geopark comprises a territory of 2,800 km² and six municipalities: Acari, Carnaúba dos Dantas, Cerro Corá, Currais Novos, Lagoa Nova, and Parelhas. Located in the Rio Grande do Norte state, extreme northeast of Brazil, this region is geologically marked by Neoproterozoic to Cambrian units, essentially, but with Cenozoic units at the top. Of the four geosites of international relevance among the 21 that currently make up the SeridóUGGp inventory, one stands out for containing a record of one of the most recent volcanisms on the South American Platform not related to the Andes: the Vale Vulcânico Geosite.

Located in the northern region of the territory, in the municipality of Cerro Corá, this geosite stands out for the occurrence of basaltic columnar disjunctions with different dips, ranging from horizontal to inclined (70° SE). Vesicular texture and some peridotite xenoliths can be seen. The main minerals of volcanic rock are olivine, clinopyroxene and plagioclase. The existence of rolled blocks along the slope forms an expressive deposit of talus in the geosite. The basaltic flow of the site is related to the Macau Volcanism, dated at 25 Ma, whose greatest surface expression is the Pico do Cabugi, a remaining volcanic neck, considered one of the symbols of the Rio Grande do Norte state, which is located about 42 km in a straight NNE line from the geosite, outside the boundaries of the Seridó Geopark.

Therefore, the relevance of this geosite is undeniable, something that was proven by Nascimento et al. (2021) in their assessment of the typologies, values, risk of degradation and relevance of the SeridóUGGp geosites. The challenge, therefore, is the protection, valuation and dissemination of this heritage. The strategies adopted comprise two focuses of action: (1) protection and limitation of the site use, and (2) actions to promote the geosite.

In the first strategy, the action was carried out through negotiations with the area owner where the site is located, since it is a private property. Thus, it was defined that access would be restricted to visitors with an authorized guide and/or conductor. The second strategy involved the development of a mascot character that represents the main element of the site, which are the columnar joints. Juju is, therefore, a representative of this heritage and has been used in promotional activities, educational activities at different levels of education and in the production of a comic book.

The geological heritage associated with the Vale Vulcânico Geosite is, therefore, essential for the Seridó UGGp, its protection depends on a partnership between a private entity and the public consortium that manages the geopark, which reinforces the need to maintain partnerships in geopark territories. In addition, its dissemination can occur in a playful way, reaching the largest possible audience, such as mascots.

INITIAL STEPS AND ACTIVITIES IN PROMOTING AND PROTECTING LOCAL INTANGIBLE HERITAGE

Susan May, *Hakusan Tedorigawa Geopark Promotion Council*

Within the area of the Hakusan Tedorigawa Geopark, numerous traditional crafts and performing arts have been carried out since long ago, each with their own cultural features that are linked with the geological and natural environment. We present the partnerships formed with initial representative groups, as well as activities conducted, such as the utilization of traditional crafts and performances at geopark events, lectures and workshops at schools and community centers, and monetary support for promotional activities that promote and protect the continuation of these important intangible heritages.

COLONIZATION AND DECOLONIZATION IN WAITAKI

Mauriri Mc Glinchey and TK Buchanan

Waitaki Whitestone Geopark resides in the heart of Te Waipounamu, the South Island of New Zealand. Te Waipounamu and the Waitaki takiwā have rich oral and written cultural heritage that has survived decades of colonization, and now this heritage is returning to a thriving state through the co-governance efforts between Māori and Pākehā from the Waitaki Whitestone Geopark trust.

Decolonization as defined by Linda Tuhiwai Smith, a Māori scholar, is as follows:

"Colonization is about the changing of names of the land. Decolonization is about reinstating the names and telling the stories of the land from an indigenous perspective." The Waitaki Whitestone Geopark aims to decolonize the landscape by honouring the Māori names and stories of the land, especially those related to the creation story of Ngāi Tahu, the local iwi (tribe).

Waitaki Whitestone Geopark acknowledges the contrast of the Western scientific worldview of Zealandia, the sunken continent that New Zealand is part of, with the indigenous worldview of Te Waka o Aoraki, the canoe of Aoraki, the most sacred ancestor of Ngāi Tahu. The contrasting worldviews are respected and upheld by co-governance of Waitaki Whitestone Geopark. Preserving this cultural heritage for Māori is decolonisation in practice.

FORMAL AND INFORMAL GEOEDUCATION - CHALLENGES AND APPROACHES WITH CASE STUDIES FROM GERMANY

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Geoeducation was severely neglected in Germany for a long time. On the one hand, there was only a very rudimentary to almost non-existent integration of geoeducation into the formal school curriculum, on the other hand, communicating geoscientific topics to the general public was considered "unscientific" for a long time. The comprehensive geoscientific research was thus hardly perceived by the population, which means that knowledge about the importance of geosciences for many aspects of life (environmental protection, nature conservation, management of natural resources etc.) is absolutely insufficient. At the same time, geoeducation programmes had been given low priority due to the "almost total ignorance" of the general public about geology, ultimately reinforcing a vicious circle. Hence, the Geo-Union, Alfred Wegener Foundation and the umbrella organisation of the German geosciences published a position paper in April 2023, calling for geoscientific content to be given higher priority in school education in order to better meet global challenges.

Geoparks can be highly effective platforms to combine geoscientific education and public relations with geotourism offers and thus counteract the "education or knowledge deficit". They thus offer a great opportunity to make geosciences better known in their entire breadth. Education in general is therefore one of the three main tasks of UNESCO Global Geoparks.

Based on a current case study (UNESCO Global Geopark Swabian Alb), strengths and weaknesses of formal and informal geoeducation in Germany are presented. Geopark schools offer a variety of opportunities to integrate more geoscientific content into the formal curriculum. Specially trained nature guides as well as professionally designed geotrails contribute significantly to informal geoeducation. But a comprehensive analysis of existing geotrails also revealed numerous weaknesses.

The paper aims to present opportunities and challenges of formal and informal geoeducation in German geoparks for discussion among an international audience.

NATIONAL GEOPARKS – MEANINGFUL ADDITION OR COMPETITION TO UNESCO GLOBAL GEOPARKS

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The Federal Republic of Germany currently has eight UNESCO Global Geoparks and a total of 18 National Geoparks. All German UNESCO Global Geoparks are also National Geoparks and members of the European Geoparks Network.

The Federal Republic of Germany was one of the pioneers of the international geopark movement. In 1994, the first German geopark, the Gerolstein Geopark, was opened in the Eifel region as part of the first international German-language geotope conservation conference. This took place at a time when geoparks in today's sense did not yet exist. Vulkaneifel (Volcanic Eifel), together with three other partners from France, Greece and Spain, was later one of the pioneers in the development of the first geopark approach and the foundation of the European Geoparks Network in 2000. In 2015, the six German European Geoparks then in existence received recognition as UNESCO Global Geoparks.

While the German institutions were among the world's pioneer geoparks, a national label developed in parallel. At the beginning of the 2000s, the dynamics of the geopark movement led to the geological services in Germany being "literally overrun with enquiries". To guarantee quality standards and curb the inflationary use of the geopark term, the label "National GeoPark" was introduced as a seal of quality. Guidelines on the geoparks' qualifications and on the assessment process were drafted by a special working group.

After two decades, the two-level system of German Geoparks can be considered very successful in terms of dynamic development, number and quality of German Geoparks. On the other hand, conflicts can arise – and have in fact occasionally overshadowed cooperation between the German National GeoParks – from a point of view that the two-tier system is also regarded as a distinction in geopark quality. Research also shows that the different labels are confusing for outsiders, especially since membership in the European Geoparks Network is sometimes seen as a third label at European level. Further confusion arises from the generally low level of awareness of geoparks, the territorial overlap of numerous German geoparks with various protected areas, such as national parks, biosphere reserves and nature parks, and the frequent confusion with conservation categories such as nature parks by the general public.

The historical development of the multi-level system in the Federal Republic of Germany is presented and substantiated by means of various case studies. The advantages and disadvantages of such a two-tier system are also addressed and compared with countries that do not have such a system. Finally, the question will be discussed whether a national geopark label is a meaningful addition to or a competitor of the UNESCO Global Geoparks.

UNCOVERING LONG-TERM SUSTAINABLE LOCAL DEVELOPMENT PRIORITIES IN THE BÜKK-REGION ASPIRING UNESCO GLOBAL GEOPARK

Balázs Megyeri, *Geopark manager, Bükk National Park Directorate, Corvinus University of Budapest*

The popularity of geoparks has risen exponentially in recent decades. With their holistic management concept of protection, education and sustainable development and their bottom-up approach, they can be a strong tool for raising awareness and equipping their communities with opportunities and knowledge to improve their lives and ensure the preservation of their environment. At the same time, advocating for sustainable development and minimizing negative impacts on our way of living and consumption has become ever more present in contemporary times. Defining and critically evaluating the role of geoparks in sustainable development is an emerging field of research. In the Bükk-Region Aspiring UNESCO Global Geopark, we are continually researching, how to embed our geopark project with local communities, and how to best align the goals and aspirations of different local stakeholder groups. This conference presentation aims to present some recent findings of focus group meetings done with participants from different local stakeholder groups and experts. The main theme of the data collection was to find common, long-term priorities for sustainable local development in our geologically, geomorphologically, and economically diverse geopark area.

The Bükk-Region Aspiring UNESCO Global Geopark is located in the northeastern part of Hungary, and it covers one of the most complex geological environments in the country. Its central zone consists of the Bükk and Uppony Mountains, both characterized by fold-and-thrust structures formed mainly during the Cretaceous tectogenesis. Within its approximately 2800 square kilometer area, more than 425,000 people live in 109 municipalities, ranging from small rural towns, to regional centers. The priorities of its inhabitants are vast, however it is of paramount importance to gain more knowledge about it, to uncover long-term priorities and possible synergies to stimulate local involvement and recognition of the geopark. Findings presented during the conference will only be primary, as based on the interactions during the data collection, the continuation of this research is warranted.

CARTOGRAPHY OF THE FOOD CULTURE OF THE GEOPARKARARIPE TERRITORY

**Francisca Jeanne Sidrim de Figueiredo Mendonça; Indra Nogueira Nunes; Maria Clarice Gomes da Silva;
Ana Karine Gomes Duarte; Samuel de Souza Santos.**

The Geoproduct program of GeoparkAraripe started in 2004 and, currently, the program is being reinvented in search of improvement and continuity. Therefore, characteristics were defined and a registration form was prepared for the registration of products to be prospected. The products related to the communities of the AraripeGeopark have a great differential and relevance because they exercise a great representation of the semi-arid region of the Brazilian Northeast where they are located. These attributes strengthen the regional identity; encourage the production of more products of local origin that have stories in their material, design and production process. Thinking about what is eaten and the correlation with territories and crafts is essential, considering that food, inputs, preparations, eating habits and knowledge rooted in practices; symbolize the cultural expression of social groups. Therefore, geoproducts are traditional but innovative products, with a direct connection to the geodiversity of geoparks, as well as the image and identity of the territory and its people. Even focused on commercialization and sale, they seek sustainability and show the local history, highlighting the references of the identity of its people. In this project specifically, the geoproducts at the heart of food and beverages, knowledge and ancestry linked to these, their manufacturing processes will be worked on. Furthermore, the main objective is to map food and beverages from and representatives of the territory's food culture; visit the producers and close partnerships to learn about the products and their cataloging; prepare a catalog of Geoproducts; develop and produce labels for product certification and certify them. The impact of the project will focus on the communities of the geosites that are part of the Araripe Geopark UNESCO, therefore, the residents of the host cities of these geosites will be impacted. A territory of six benefited cities with approximately 600,000 (six hundred thousand) inhabitants is included.

THE SUPPORT OF THE PORTUGUESE UNESCO GLOBAL GEOPARKS NETWORK TO THE PORTUGUESE ASPIRING GEOPARK TERRITORIES

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2. *Arouca UGGp,*
3. *Azores UGGp,*
4. *Terras de Cavaleiros UGGp,*
5. *Estrela UGGp*

UNESCO Global Geoparks (UGGp) are unique territories “Celebrating Earth Heritage and Sustaining Local Communities”. To become a UGGp is a huge challenge that includes learning from your own territory and from examples of other territories that have achieved this goal. In Portugal there are five UGGp (Naturtejo, Arouca, Açores, Terras de Cavaleiros and Estrela) and three aspiring territories (Oeste, Algarvensis and Viana do Castelo). In 2022 was created the Portuguese UGGpNetwork, and one of its attributions is to promote the development of new UNESCO Global Geoparks in Portugal, providing technical and scientific support to new national applications. Some of the various opportunities for networking and cooperation offered to aspiring territories include:

- Participation in the regular meetings of the coordination committee of the network, as observers, allowing a better understanding of the Statutes and Operational Guidelines for UNESCO Global Geoparks and discussions about the challenges of becoming a UGGp;
- Involvement in the Action Plan of the network, contributing to the development of holistic activities in the aspiring territories, awareness on main focal points of geopark’s activities and connection with local communities;
- Sharing ideas and methods for educational projects;
- Participation in the common UGGp’s stand in the Lisbon Tourism Fair, promoting the territory through local products and its connection to geological heritage;
- Field trips and meetings in other UGGp, providing the opportunity to perceive, in the field, the work developed with the partners, the visibility of the Geopark in the territory and the connection with the local community;
- Technical visits from UGGp, to discuss plans and ideas, exchanging knowledge.

Despite the three aspiring territories in Portugal being in different stages of their application, they all took this opportunity of networking and cooperation and truly got engaged with the essence and principles of UNESCO Global Geoparks.



From left to right : Common participation of the Portuguese UGGp and aspiring territories in the Lisbon Tourism Fair; 1st Meeting of the Portuguese UGGp’s Network, in Azores ; Technical visit to Oeste aspiring Geopark.

BOHOLI ISLAND GEOPARK: A STRATEGY TO WARD RESILIENT, GREEN, AND INCLUSIVE DEVELOPMENT

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Situated in the central portion of the Philippine Archipelago, the island province of Bohol is home to magnificent geological and geomorphological features of international and national significance. Its geologic history is marked by periods of tectonic turbulence and occasional quiescence spanning nearly 150 million years in the making. Forming the island's basement rocks are the Alicia Schist and the Bohol Ophiolite, an exposed slice of an ancient oceanic lithosphere. The repeated cycles of emergence and submergence provided excellent conditions to form exceptional karst landscapes that gave rise to the formation of the famous Chocolate Hills, sinkholes, cave pools, and marine terraces.

The Boholanos' desire to protect and conserve its geological heritage, along with its natural and cultural heritage, led to its aspiration to become part of the UNESCO Global Geoparks Network (UGGN). Global Geoparks are important territories with sites and landscapes of international geological significance that are managed through a holistic community-led approach of combining conservation, education, and sustainable development.

The UNESCO Global Geopark principles perfectly harmonize with the provincial government's vision for Bohol Island to be a prime eco-cultural tourism destination and a strong, balanced agri- industrial island province, where local communities are proud of their heritage and committed to sound environmental management. As part of the local government's long-term Environmental Sustainability Roadmap 2023-2031, sustained international recognition of Bohol as a UNESCO Global Geopark is one of the key indicators of a resilient and green province.

The island province of Bohol is the first and only aspiring geopark from the Philippines to formally apply for this UNESCO designation since 2019. Despite its deferment for two years, the geopark team was more driven to improve the functions and operations of Bohol Island aspiring UNESCO Global Geopark as shown in the progress report submitted to UNESCO in 2022. The report was carefully reviewed and discussed during a GGN Council meeting that resulted in its nomination as one of the 18 new UNESCO Global Geoparks for the endorsement of the UNESCO Executive Board in May 2023.

Presently, the aspiring geopark continues to strengthen its management and functions through partnerships and collaborations with various public and private institutions and organizations, especially in the areas of research, education, tourism, and conservation of geological heritage. International collaboration through a UNESCO International Geoscience Programme Project is also among the efforts to improve the visibility of Bohol within the Network.

THE EDUCATIONAL PROGRAMS OF THE LAVREOTIKI UNESCO GLOBAL GEOPARK AND THE ENVIRONMENTAL CENTER, GREECE

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Scientific research on the Lavreotiki landscape originated about 200 years ago. By 2023, the bibliography on the topic already totaled over 300 titles and an immense scholarly interest in the geopark and its geological, mining, metallurgical, cultural, historical, archaeological and environmental value, began to develop. The unique mineralization and the exploitation of silver-rich lead ore during prehistoric and modern times was always in the spotlight of the local community. Therefore, successful efforts had been made to simplify the scientific knowledge and create educational programs addressed to students and the general public.

The Lavrion Environmental Centre in collaboration with the Lavreotiki UNESCO Global Geopark implements a series of educational programs to promote the biodiversity and the geodiversity of the district. All programs are designed to enhance environmental awareness and help people and society adjust to the climatic crisis. Through experiential learning and interactive teaching, the audience can comprehend the simplified, scientific knowledge provided on the geopark's geosites and adapt new concepts for a sustainable future. These programs are constantly enriched and modified, in order to cover the different needs of the visitors and the society.

Examples of the educational programs implemented on the field:

- The Forest has its own History (Sounion National Park)
- A new forest is born (Sounion National Park)
- I orient to Chaos geosite
- Walking down a miner's road (Environmental center, Lavrion Technological Cultural Park)
- Silver source (Soureza valley: mining and metallurgical center)

MANAGEMENT OF MULTI-DESIGNATED UNESCO PROGRAMS IN THE HANTANG RIVER UNESCO GLOBAL GEOPARK AND BIOSPHERE RESERVE.

Miyeon Yoo, Daewoo Kim

The Hantangang River UNESCO Global Geopark (2020.07. Certified) is designated with Yeoncheon Imjin River Biosphere Reserve (2019.05. Certified) & Gangwon Eco-Peace Biosphere Reserve (2019.05. Certified) and is located in near borderline between South Korea and North Korea. The Demilitarized Zone (DMZ) and the Civilian Control Line (CCL) exist on the border area between the two Korea, which limits the access of the general public, preserving the natural environments that have not been developed. Due to the characteristics of the border area, UNESCO Global Geopark on the Hantangang River also has a natural heritage that encompasses various geodiversity and biodiversity. Yeoncheon-gun County Office, the UNESCO Global Geopark Management body of the Hantangang River, integrates the management organization into a Geopark & Biosphere Reserve team for the smooth operation and maintenance of the Global Geopark and Biosphere Reserve conservation area. The Geopark & Biosphere Reserve team focuses on more efficient operation by combining the geodiversity of the Global Geopark with the biodiversity of the Biosphere Reserve. In addition, for this purpose, projects such as research, infrastructure installation, and NGO support are not carried out independently of each UNESCO protection program, but are carried out in terms of integrated management. Based on this current situation, would like to introduce educational programs and tourism programs prepared for the future and the performance of integrated management conducted in the past.

ASPIRING GEOPARK DEVELOPMENT OF ASPIRING GEOPARK PANGANDARAN-INDONESIA THROUGH COLLABORATIVE RESEARCH ACTIVITIES

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The Aspiring Geopark Pangandaran covers areas of natural landscapes, namely karst landscape areas, old volcanoes, and Cisagaraanakan lagoons. It is geographically located approximately 400 km from Jakarta, the capital city of Indonesia. The establishment of Pangandaran Geopark was created in 2017, and in 2020 the Aspiring Geopark Pangandaran registered to become a national geopark. The Pangandaran area is dominated by the ethnic Sundanese people. They have ancestral traditions that manifest through many ceremonies with songs and dances. Aspiring Geopark Pangandaran has a sloping elevation to high waves with a maximum height of 1050 mdpl. The diversity of the landscape is generally in the form of karst hills, volcanic hills, coastal plains, and Rompin. The diversity of rocks is generally in the form of limestone, old volcanic rock, alluvium, and coastal sediments. The geological history of Aspiring Geopark Pangandaran is part of the geological evolution information of a karst hill system, 10-15 million years ago (Miocene), which then took place to form volcanoes. The typical natural landscape is, with the process of forming a spit or bar that connects an island to the mainland or between one island and another.

Pangandaran has many protected territory/sites, includes not only a certain number of geosites with exceptional interest but also many places of ecological, archaeological, historical, and cultural values. From the mapping and survey results, at least 5 geosites (Tombolo, CukangTaneuh, Majingklak, GuaBahu) were determined. Moreover, the territory of the Geopark contains 2 sites of biological and ecological Interest (SagaraAnakan Lagoon and Pananjung Nature Reserve park), and there is also the protected forest as a conservation area for many wildlife. The geodiversity in Aspiring Geopark Pangandaran is a geotourism destination, such as beaches, protected forests, and rivers in the Karst area.

Collaborative studies have been carried out in Aspiring Geopark Pangandaran, such as environmental geology studies for these various purposes by Geological Agency, for example: determining the karst landscape area (KBAK); determining the geological nature reserve area (KCAG); and determining the designated mining area (KPP). Currently, there is a study conducted by Padjadjaran University to explore the fossils found in the area, such as the Megalodon shark's tooth fossil in collaboration with the local community. A study and community empowerment program were also conducted at villages on capacity building in the topic of geodiversity, geoconservation, geotourism, and geo product collaboration university and community also local government. Aspiring Geopark Pangandaran in the future will conduct a study on geodiversity, geosites, and geopark with other stakeholders (academia, government, CSO, media, and private companies).

ENVIRONMENTAL ASSESSMENT GEOHERITAGE IN CAMEROON

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Cameroon is situated in central Africa Area: 475440km², Population : 24.7 Million Cameroon is found along the Cameroon line (CL) , which is 1600 km long and 100km wide (Déruelle, B. el al., 2007). It stretches from the Gulf of Guinea (Atlantic Ocean) to the LakeChad (KagouDongmo, 2006; Nkouathio, 2006; Youmen, 1994).These environments around the CL are made up of important assets (heritage); lakes, mountains movable minerals etc. The country is blessed with numerous precious, semi-precious minerals, germ stones and construction materials which have attracted a handful of investors already and it is open to more investors. Inventory Mount Fako - south west, Ako'Akas massive rock- south-east of Ebolowa, Mount Bamenda. Legislation compared to many western nations, and like much of Africa environmental governance is a recent practice in Cameroon. The mining sector has a framework law which outlines the general legal framework for environmental management in Cameroon. This law is based on the principles of protection, prevention, precaution, pollution, corrective actions, and sustainable management of the environment. There are also some buildings and monument around the country an integral part of the population makes great use of our heritage. That is the educational sector uses the geomorphology and other landforms for academic purposes, the touristic sector uses the Calderas Mountains, lakes, waterfall .The mount Cameroon race of hope is being done yearly and it's international. Even though our geoheritage is being used, much has to be done through legislation to conserve, preserve and make it more attractive to the nation and the world at large.

REVITALIZATION OF TRADITIONAL ACTIVITIES AS A FACTOR OF RURAL DEVELOPMENT: A CASE STUDY OF THE VILLAGE OF MORAIS, TERRAS DE CAVALEIROS GEOPARK

Antónia Maria Morais, *Geopark Terras de Cavaleiros*

Rural areas and the traditional way of life have faced a global crisis in recent years, particularly in developing countries, as urbanization and modernization have led to the disappearance of traditional agriculture and rural culture. However, in the last decade, more attention has been given to preserving traditional and culturally significant villages in Portugal, with rural tourism recognized as a key approach to sustainable rural development. The village of Morais, located in the Terras de Cavaleiros Geopark, is one such village that has undergone a rehabilitation project of an ancestral agricultural technique known as « Malha e Ceifa ».

The article presents the results of a research project that aimed to determine whether the revitalization of traditions, particularly those related to culture and animation, could attract tourists to the village. The methodology used was quantitative, utilizing a survey questionnaire. The results indicate that the revitalization of cultural experiences, such as the recreation of traditional practices, offers visitors a socio-cultural experience that is characterized by warmth and hospitality.

The results confirm the initial hypotheses, but the community must decide on the path it wants to take, particularly if tourism is the chosen route. The decision to pursue tourism requires careful consideration of the challenges it poses. Nevertheless, the success of the rehabilitation project in Morais demonstrates that sustainable tourism can contribute to the revitalization of rural areas and the preservation of cultural heritage.

THE CASE OF CARETOS DE PODOENCE: TOURISM SUSTAINABLE PRACTICIS IN RURAL AREAS

Antónia Maria Morais, *Geopark Terras de Cavaleiros*

In recent years, rural tourism has gained increasing attention as a way to promote local development and preserve cultural heritage. Rural communities are often characterized by unique cultural and natural assets that attract visitors seeking authentic and sustainable experiences. However, tourism development can also bring challenges and negative impacts if not managed properly. In this context, integrating sustainable tourism principles is essential to ensure that tourism benefits both the community and the environment in the long term.

The article focuses on the case study of Podence, a village in Portugal renowned for its intangible cultural heritage, namely the Caretos tradition, which has been recognized by UNESCO. The research aims to understand how the community has leveraged its cultural heritage to develop sustainable tourism practices that benefit both the community and the environment.

Using a qualitative approach, semi-structured interviews were conducted with local stakeholders, including residents, business owners, and cultural practitioners. The results show that tourism has had a positive impact on the community by creating employment opportunities, generating income, and preserving cultural heritage. However, challenges such as seasonality, lack of infrastructure, and the need to balance economic development with environmental protection were also identified.

The study concludes that integrating sustainable tourism principles is essential for rural communities to achieve long-term benefits from tourism development. This requires a collaborative approach involving all stakeholders and a commitment to balancing economic, social, and environmental goals. The case study of Podence provides valuable insights for other rural communities seeking to develop sustainable tourism practices that contribute to local development and cultural preservation.

Keywords: rural community, cultural heritage, local perspectives, tourism sustainability

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**: INDUSTRIAL AREA OF ANCIENT MINING & METALLURGICAL ACTIVITY IN LAVREOTIKI UNESCO
GLOBAL GEOPARK, GREECE**

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The area of the Lavreotiki UNESCO Global Geopark was mined for silver, lead and other metals since ancient times (at least since the 3rd millennium B.C.) These polymetallic ore deposits were genetically related to the emplacement of a Late Miocene (7-10 million years ago) biotite-hornblende granodioritic body and granodiorite porphyry dikes/sills within metamorphic Mesozoic rocks of the Attic-Cycladic Crystalline Belt. The ore consisted mainly of silver-rich galena, sphalerite, and pyrite, but also various other sulphides and numerous secondary minerals.

Soureza Valley (Fig.1), an archaeological site located into the Sounion National Park, is the most representative site of the geopark's ancient mining and metallurgical activity, which triggered an unforeseen civilization. The whole area hosts numerous mining galleries and metallurgical workshops, as well as other installations to house the miners. The mining and metallurgical work followed a specific practical procedure, which was relevant to the kind of the extracted mineral, the depth of its deposits and the essential processing and subsequent smelting for the extraction of the argentiferous lead. With the development of technology, the mining and metallurgical practice relatively improved and more productive technological facilities and installations were invented. As a result, the whole metalliferous land of Soureza, became an immense worksite. Today, many of the beneficiation workshops (ergasteria) are well preserved. The working spaces included the ore crushing and grinding areas, a washing plant (Fig.3), the stock rooms for the ground ore and the concentrate and one or more water cisterns (Fig.2) for the operation of washeries.

**GEPARK LEARNING PROGRAMS AT ELEMENTARY AND JUNIOR HIGH SCHOOLS IN THE UNZEN
VOLCANIC AREA UNESCO GLOBAL GEPARK**

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The Council of Unzen Volcanic Area Geopark (hereinafter called “the Council”) has been conducting a large number of Geopark Learning Programs (hereinafter called “Geo-Learning Programs”) at elementary and junior high schools in its territory covering three municipalities, namely, Unzen City, Shimabara City and Minamishimabara City. In the last 11 years from 2012 to 2022, a total of 370 Geo-Learning Programs were conducted, and the number of Programs has significantly increased in the last 3 years. It has more than doubled from 24 programs in 2012 to 51 programs in 2022.

One of the main reasons for the expansion of Geo-Learning Programs is that the Council has shown this program can be used in “hometown education” as well as a variety of subjects in school education to meet the diversifying learning needs at schools with the introduction of the New Courses of Study into school curriculum in Japan. In order to promote the Geo-Learning Programs and widely disseminate its information to local schools, the Council has prepared a one-page simple information leaflet of the Geo-Learning Programs and distributed it to local schools through the Boards of Education of three municipalities. In the light of the increasing tasks of school teachers today, the demand for Geo-Learning Programs is expected to increase further.

While the Council has accumulated expertise and learning materials of the Geo-Learning Programs, it has not examined the details of the Programs until recently. This presentation will introduce the findings on characteristics and issues of the Geo-Learning Programs based on the analysis of the last 11 years (2012-2022) of the Programs. The analysis covers the different trends in numbers of the Programs conducted in each of three municipalities at elementary schools and junior high schools respectively, the classification of learning contents into five categories, the attributes of instructors for different contents, and the characteristics of Programs in each municipality linked to locations of different types of geo-sites. The presentation will also discuss the future challenges and prospects of the Geo-Learning Programs in relation to its own sustainability in providing a larger number and wider contents of programs.

THE CHALLENGE OF OGUNI CEDAR WOOD JEWELRY - CHALLENGE TO EXISTING VALUE AND ETHICAL CONSUMPTION-

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The Geopark aims to create a sustainable society, however, in achieving this goal, we have to create new value for our society. One of the existing values we need to challenge is the value of minerals as gems. Minerals are shiny and beautiful and fascinate people. And because they are solid, they are also recognized for their eternity. In contrast to the eternity guaranteed by the direction of the minerals, the eternity and connection guaranteed by the community and its industry are the new values found in AsoUGGp.

In Aso Geopark, Ogunist LLC, together with Ogunimachi Owners Association, has developed jewelry made of Ogunicedar wood. Oguni cedar has been planted in Aso for 250 years and is one of Japan's representative building materials. The jewelry is made from discarded parts of this building material. In other words, as long as the community of Oguni Town continues its traditional industry of afforestation, the eternity of this jewelry is assured. The jewelry is also designed so that local grandmothers and mothers on childcare leave can hone their skills and make the jewelry, thus empowering women. Furthermore, the jewelry is available for free repair, so that when a purchaser passes on Ogunist jewelry to his or her children, for example, the children will have a connection to Oguni Town, even if they have never been there. Through the jewelry, Oguni Town in Aso and people far away can be connected across generations.

AsoGeopark would like to think about future lifestyles that will lead to the next goals of the SDGs and well-being from these efforts.

NEW EARTHQUAKE MUSEUM "KIOKU"- EXPERIENCE FROM THE HUGE EARTHQUAKE IN ASO UNESCO WORLD GEOPARK, KUMAMOTO, JAPAN IN 2016.

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Aso UNESCO Global Geopark consists of 8 municipalities in Kumamoto Prefecture, southwest Japan, and joined the GGN in 2014. AsoUGGp is characterized by a huge caldera that was created by the 4 Mega eruptions that occurred between 270,000 and 90,000 years ago. Like Toba Caldera UGGp, a caldera lake was once formed, but it is now gone and the bottom of the caldera is exposed. About 50,000 people live at the bottom of the caldera, and about 20,000 live outside the caldera. It is one of Japan's most popular tourist destinations, with its active volcano, Nakadake, and the caldera's grassland landscape. However, the area is at high risk of geohazards such as active volcanoes and landslides, and earthquakes due to its tectonic setting.

In 2016, the magnitude 6.5 and 7.3 Kumamoto earthquakes occurred. The earthquake was so massive that it was the first time in Japanese history that earthquake intensity 7 (Japanese criteria of the earthquake) was observed twice. Up to 180,000 people were forced to live in shelters and 55 people died in connection with the earthquake. As the first region in the UGGp region to be hit by a huge earthquake disaster, Kumamoto Prefecture, in cooperation with Minamiaso Village, Kumamoto University, and other stakeholders, will open a new disaster mitigation center in Museum to be opened by Kumamoto Prefecture in July 2023.

What makes this facility unique is that it not only conveys the geological background and tragedy of the earthquake but also prepares questions for visitors.

“Who would you contact first when a disaster occurs?”
“What kind of activity of the earth created that scenery?”
“What position do you think you will be in to deal with a disaster ten years from now?”

The Kumamoto earthquake taught us the importance of being prepared and asking questions on a daily basis. And that is what we believe will lead to the development of negative capability, the ability to stay in the midst of situations that have no answers. We would like to utilize this question created by Kumamoto Prefecture and Kumamoto University, which designed this facility, internationally in the future as the AsoGeopark

TOWARD THE ESTABLISHMENT OF A NEW IMAGE OF ASIA THROUGH NETWORKING VIA THE VOLCANIC CAVESWORKING GROUP IN APGN

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UNESCO Global Geoparks are working to create new values after covid 19 pandemic. It also proves its value as a new international travel destination worldwide. We have launched the Volcanic Caves Working Group in order to repaint the world's image of Asia. The conventional image of Asia in the world may be oriental, agriculture, and ethnic dress. However, many of us live in a tectonic zone, and volcanoes are the backdrop of our traditional cultures. In particular, members of this working group, the lava tub of Komezuka in Aso, Japan, Krong No Volcanic caves area (up to 49 caves so far) within DakNangUGGp, Vietnam, Susu cave in Rinjani Lombok, Indonesia, and Manjanggul Lava Tube in Jeju Island, Korea, consider caves as a gateway to explore cultural backgrounds. This working group was organized at the APGN in Satun, Thailand, in 2021 at the call from the DakNongUGGp and the Rinjani-Lombok UGGp. In 2021, the first Geodiversity Day was co-hosted by the Rinjani-Lombok, Aso and DakNongUGGp through a webinar. Additionally, on the International Disaster Reduction Day, flyers on disaster reduction efforts in various regions were produced at the call from AsoUGGp. Furthermore, in November 2021, Jeju Island UGGp of South Korea joined this group, which officially started as a working group at the 20th International Symposium on Volcano speleology held in Dak Nang UGGp. This working group was organized at the APGN in Satun, Thailand, in 2021 at the request of, The working group has been active in introducing local culture and Asia through volcanic caves at tourism expos in each country, as well as in educational networking. As part of this, a brochure for the Volcanic Cave Working Group was created in July 2023. As part of this effort, a flyer for the Volcanic Caves Working Group was created in July 2023. By listing each of the volcanic caves in comparison, we were able to express their international value more clearly than if they stood alone. There is no doubt that each region's value is enhanced through networking, and we believe this is a good example of how this can be demonstrated to society as a strength not found in other UNESCO programs.

DESCRIPTION AND POSITIONING OF ANERGUI REGION'S GEOSITES WITHIN THE ALPINE GEOLOGICAL HISTORY OF THE M'GOUN UNESCO GEOPARK (MOROCCO)

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The UNESCO M'Goun Geopark (UMG) is situated in the central High Atlas region of Morocco. The expansive landscape of this geopark owes its geological features to a series of sedimentation phases that occurred during the Jurassic and Cretaceous periods, initially at the edges of the Tethys ocean and later the Atlantic ocean. The tertiary period played a significant role in shaping the current mountainous terrain, characterized by a diverse topography that adds to the region's breathtaking beauty. This includes the formation of deep gorges, the creation of long valleys with flat floors juxtaposed with narrow elevated sections, the emergence of perched karst plateaus, and the presence of waterfalls.

Within this geological context, the Anergui region holds a pivotal position within the UMG. It is situated at the heart of the geopark and features a high valley through which the Assif Melloul river flows. The valley is surrounded by plateaus and peaks that rise above 3000 meters in altitude. The visual landscape is distinguished by steep dolomitic-limestone cliffs. These cliffs have elevated plateaus atop them, exhibiting extensive and jagged lapies fields along with sinkholes, exemplified by the Ait Abdi plateau. The cliffs serve as boundaries for both deep gorges like Akhachane and Batli, as well as a wide combe, giving rise to the present-day Anergui valley. This valley contains an intrusive core formed through the amalgamation of several gabbroic masses intertwined with fragments of metamorphosed Lower Liassic limestone, all enveloped within a Triassic red clay-sandstone mass.

The endeavor to enrich the geosites of this region is a prolonged undertaking that encompasses the selection, description, and classification of these sites. Given the limited availability of comprehensive geological studies about the area, this work emphasizes describing these sites based on the geological and geomorphological phenomena that have contributed to their formation:

1. The expansion of the High Atlas basin during the Jurassic era, leading to intrusions and gradual unconformities linked to the establishment of the Anergui ridge through diapiric activity.
2. Sedimentological and paleontological features accompanying the growth of lower and middle Jurassic carbonate platforms.
3. The impact of Cretaceous and Tertiary compression, resulting in geological structures arising from the deformation of the carbonated layer of the Dogger, including its interaction with the intrusive cores of Anergui, Batli, and Adendoune.
4. The elevation of the landscape during the Tertiary period, leading to the creation of gorges like Akhachane, Batli, and the Aftis circus, interconnected with the Assif Melloul's complex hydrographic network.
5. Erosion during the Quaternary period, leading to the formation of residual detrital alluvial deposits, and various forms of alteration affecting different rock types such as carbonate rocks (karsts), detrital rocks (badlands), and volcanic rocks (ball weathering of gabbroic intrusions).

This scientific mediation approach serves to showcase these observable geological phenomena within a relatively confined area, providing a comprehensive narrative that encapsulates much of the alpine geological history of the UMG

Keywords: High Atlas, UNESCO Mgoun Geopark, Anergui, Geosite, Alpine geological history, Morocco.

ACTIVITIES OF THE JAPAN GEOPARK COMMITTEE AND JAPANESE GEOPARKS NETWORK

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The Japan Geopark Committee (JGC) was set in 2008 outside the Japanese UNESCO NATCOM of MEXT, and was certificated in 2016 by the NATCOM to be responsible for nomination of the aUGGp from Japan and related tasks. It works closely with the Japanese Geoparks Network (JGN), originally started in 2007 and became the NPO in 2011; presently 46 National Geoparks (ordinary members), among which 10 are UGGps, plus 7 subsidiary members (aspiring national Geoparks) and individual and supporting members. JGC has 3 regular meetings a year for discussing on nominating aUGGp and designating national Geoparks through national evaluation-revaluation missions, and advising UGGps one year before their UNESCO revalidation. Its every year activity includes advanced consultations for UGGp and national geopark applications, online meeting with JGN on evaluation concept, in-situ training of members at one of UGGps in Japan, and training for new staff of JGN members. Reviewing of geological international significance for aUGGp candidates in Japan is outsourced to “Japan Geopark Academic Support Union” (JGASU), established in 2021 outside the JGC and JGN. JGN holds annual national meetings, block meetings, and theme-based training courses, and promotes the activities of working groups on collection/selling of geological materials, natural disasters monuments, conservation, education, natural disasters, international relationship, ecosystem, geotourism, science and roles of experts, and universal design. It also held the workshops on capacity building in Thailand with colleagues of SE-Asia countries, and the ODA-workshops in Japan by inviting colleagues of SE- and Central-Asia countries. JGN continues the exchange program with Geoparks in China and SE Asia countries under the APGN flag. The Declaration of JGN Initiatives for the “UN Decade of Ocean Science for Sustainable Development” was issued in 2021, and the international, hybrid “Marine Debris Symposium” was held in Oki Islands UGGp in March 2023. The “public session on Geopark” in the Japan Geoscience Union’s annual meeting every year, becomes an excellent opportunity to advertise Geoparks and exchange our experiences. JGN grew the Geopark ambassadors registered by tour-guide interpreters, and contracted with AEON Environmental Foundation. JGN-agreement partner, National Research Institute (NIED) provides the geographical information on real-time/past earthquake monitoring data including ancient disaster records for JGN members’ areas on demand, useful in schools and museums and on geosites.

HOT SPRING AND ITS UTILIZATION IN GEOPARKS

Setsuya Nakada, Japan Geopark Committee

The utilization of hot springs varies worldwide, reflecting the diverse cultural, geographical, and regulatory contexts (wellness and relaxation purposes, geothermal energy production, ecological and natural aspects). In Japan, hot springs, known as "onsen," hold deep cultural significance. They are an integral part of Japanese traditional culture and are celebrated for their therapeutic and spiritual qualities. Onsen festivals and events showcase local traditions, including performances, food, and art, further intertwining hot springs with Japanese culture.

The culture of bathing in hot springs seems to have spread in Japan around the 16th century. In recent years, young women and families have been visiting hot spring inns in rural areas. Most geoparks in Japan have hot springs that help to enhance the attractiveness of geoparks and attract tourists. In Japan, the "Onsen Law" defines a hot spring as having a temperature above 30°C at its source or a specific chemical composition. Onsen in Japan are divided into volcanic and non-volcanic. Hot springs are most abundant on or behind the Volcanic Fronts (the distribution limit of active volcanoes on the Ocean side) and less abundant on the Ocean side of the Volcanic Fronts. In Japan, hot springs near the boiling point can be found along active faults far from active volcanoes. Yumura Hot Spring in the San'inKaigan UNESCO Global Geopark is one of the examples.

Hot springs exhibit strong chemical diversity due to (1) mixing of seawater, groundwater, and volcanic gases, (2) chemical reactions with rocks along the passage, and (3) separation of liquids and gases in boiling. For example, on the Izu Peninsula, the hot springs are called simple, chloride, sulfate, sulfur, and iron-containing springs. Each of these hot springs has different benefits for the user.

For example, the Izu Peninsula UNESCO Global Geopark, where the Quaternary volcanic rocks and active faults are distributed, and Hakone national Park, where there are relatively old active volcanoes, have many volcanic hot springs, which have long been used by tourists and have been the setting for literary works. On the other hand, the adjacent Mt. Fuji, one of Japan's largest young, active volcanoes, curiously has no hot springs. The abundance of cold springs around Mt. Fuji suggests that the high permeability of young scoria deposits means that rainwater cannot remain in the volcano long enough to be heated by the magma reservoir, which is scientifically considered to be at a much deeper level.

Hot springs can be effectively utilized in geopark activities to enhance visitor experiences and promote geological appreciation. By integrating interactive tourism, thermal bathing, wellness program, geothermal energy showcase, cultural events, and scientific background, Geoparks can effectively utilize hot springs to create a comprehensive and immersive experience that combines geology, wellness, cultural appreciation, and sustainable practices.

SET-NET FISHING IN MUROTO UNESCO GLOBAL GEOPARK AS A SUSTAINABLE FISHERY: ON THE BRAND STRATEGY OF YELLOWTAIL AND A DOCUMENTARY ABOUT A YOUNG FISHERMAN

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The Muroto UNESCO Global Geopark (MUGP, hereafter) has decided to designate the set-net fishery as its own intangible heritage that should be protected. This includes the fishing method of the set-net fishery on the east coast of the Muroto Peninsula, and the way the fishery is managed in the community. This is in recognition of the fact that set nets are a fishery that makes excellent use of the seafloor topography and deep seawater upwelling, the history of the fishery from its beginning to the present, its operation under the shareholding system of the fishing community, and its sustainable operation that does not exhaust the resource.

On the other hand, the set-net fishery, which is also an industry currently practiced, faces several challenges in terms of sustainability. Challenges include: 1) changes in the marine environment due to the effects of climate change, 2) changes in the catch season and biological characteristics due to rising sea water temperatures, 3) unstable earnings due to fluctuations in catch, 4) aging population due to lack of successors, and 5) low fish prices in the supply of marine foods. The presentation will report on the yellowtail *Seriola quinqueradiata* branding strategy and current status being promoted by fishery related parties in Muroto based on scientific resource management and assessment against these challenges. MUGP is cooperating in this branding as an important initiative linked to climate change adaptation measures and the SDGs.

MUGP is also planning to create a documentary series called “Muroto Voice”, which will feature young fishermen in the set-net fishing industry. By depicting the external impact of environmental changes in the ocean on fisheries and the internal conflicts faced by young fishermen who will lead the next generation, the documentary aimed to consider the SDGs from a variety of perspectives. The presentation will also report on this documentary.

SELLING OF GEOLOGICAL MATERIALS

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“Yellow Card” was given to San'in Kaigan Geopark, as the results of revalidation discussed at UNESCO Global Geopark Council 7th session in December, 2022.

The main reason was the sale of geological materials at private museum shop located near key geosite within the San'in Kaigan Geopark. The shop together in the museum, founded by local residents 50 years ago, has been selling beautiful stones, minerals and small fossils, collected outside the geopark, procured from distributors since then. The museum operator believes that such sales will arouse interest in geoscience.

The business of selling geological material does not violate the law based on the Japanese legal system. Until now, we have struggled to reconcile the “noble geopark idea” and “the business operator's desire for a harmless commercial activity.”, and this time, we will start the challenge of finding a new good landing point.

It seems that there are other geoparks in the world with similar problems. A rough road is ahead of us, but for the sake of the earth and the people of the future, we would like to find a way to live together with the geopark and this museum, which is one of the local members, while exchanging opinions with our colleagues around the world. By doing so, we, the San'inKaiganUGGp, as a member of the UGGp, would like to contribute to the development of the UGGp.

REDUCING INEQUALITIES IN AND AROUND THE NORTH PENNINES UNESCO GLOBAL GEOPARK, UK

Naomi Foster, *North Pennines UNESCO Global Geopark*

This talk is about some of the ways that the team and partners at the North Pennines UNESCO Global Geopark are trying to improve inclusion and equality in the work that we do, addressing SDG 10 – reduced inequalities and especially Target 10.2 to “empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status”. This includes an action research group we have formed over the past two years with representatives of diverse communities and what we have learned from this process about building relationships, working together and the challenges faced by different people when engaging with us as collaborators, visitors and residents. Recently we have also been working towards an Autism Acceptance Award, improving staff awareness of neurodiversity and how to be more inclusive of neurodivergent and autistic colleagues, visitors and volunteers. We have also been working with different groups of disabled people, people of different religions and children from low-income areas. The presentation will include examples of successes and failures we have experienced along this continuing journey.



HARNESSING DIGITAL INNOVATION FOR SUSTAINABLE TOURISM IN GEOPARKS

Blanka Nedvědická, Bohemian Paradise UNESCO Geopark

The intersection of geoparks, sustainable tourism, and local development presents a unique opportunity to enhance visitor experiences while preserving natural beauty. The Bohemian Paradise UNESCO Geopark, a haven of natural splendor, has embraced this opportunity by partnering with SmartGuide, a global digital guide platform. This partnership aims to inspire tourists to explore less frequented areas, thereby mitigating the impact of summer weekend crowds at popular spots within the geopark.

The SmartGuide platform offers a user-friendly web editor, smart route generation, automatic text-to-speech audio, easy translations, and quick content updates, all without the need for IT development. It transforms a traveler's phone into a personal tour guide, offering 800 guides in a single app, self-guided audio tours, offline maps, and engaging stories that play as visitors explore. The platform supports multiple languages in both text and audio formats.

SmartGuide's robust maintenance and support system is underpinned by reliable, cloud-based technology, ensuring 99.99% uptime and fast global availability. It offers unlimited scalability, automatic updates, and full app maintenance, keeping pace with the latest Android and iOS changes. Importantly, SmartGuide provides dedicated customer support and ensures GDPR-compliant handling of user data.

The platform encourages exploration of less visited places by recommending trails outside of tourist hotspots and providing engaging stories about geology, literature, culture, and nature. Unlike printed materials, the digital platform allows for unlimited content, thereby offering endless inspiration. Heatmaps illustrate the impact of spreading visitors, with an example from Prague showing that interesting content inspired tourists to spend 30% of their time outside of the crowded city center.

In the near future, SmartGuide plans to launch personalized recommendations based on AI understanding of individual preferences, further enhancing its role as a friend of pristine nature. This innovative approach to sustainable tourism represents a significant stride in the tourism industry, demonstrating the potential of digital tools to enhance visitor experiences while promoting conservation and local development.

THE “FOREST OF THE ROCKS”: AN EXHIBIT TO EXPLORE THE GEODIVERSITY OF SESIA VAL GRANDE UGGP

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On the occasion of the first UNESCO World Geodiversity Day (6 October 2022) and the 16th European Geopark Conference "EGN2022" (Verbania 26-30 September 2022), the University of Turin in collaboration with Earth Sciences Department proposed an initiative of high scientific value, dedicated to the theme of Geodiversity in the Sesia Val Grande UGGp, through an exhibition path and a multimedia installation that transformed the Rectorate Courtyard of University of Turin into “a window on the world of Geoparks”.

The exhibit, “GEOdiversUniTo: the Forest of the Rocks”, is a multimedia installation for showcasing the geodiversity of the UGGp, with features from the Sesia Val Grande UGGp. The exhibit consists in objects (rocks, artefacts, water, ice), sounds and images illustrating the variety of landforms, materials and geological processes that characterize not only the Sesia Val Grande UGGp, but also the other Geoparks in Italy, to celebrate Geodiversity, enhance the Geological Heritage and promote Geotourism within the Global Geoparks Network.

The main attraction of the exhibit was located at the centre of the Rectorate Courtyard. The installation reproduces exactly the shape of the Sesia Valgrande UGGp and accommodated materials belonging to human and natural action within the Geopark (sediments, water, materials transformed by man and by nature itself, etc.). Those materials are confined within metallic containers or placed on metal pedestals of different heights.

In particular, the exhibit shows a unique geodiversity space, with rocks from Earth’s mantle, lower and upper crust to sedimentary rocks, of utmost importance. In this way, the visitor can move around the installation and appreciate a geological cross section of the Sesia Val Grande Geopark withing few square meters. Hence, the “Forest of the Rocks” is a representation of geological and cultural heritage of the Geopark.

The significance and goal of the “Forest of the Rocks” is making people aware of the fact that rocks can be “alive”, as a wood, but in geological times, difficult to sense by non-expert people. Moreover, knowledge on geodiversity makes easier prevention and mitigation of natural hazards and risks. To ensure these results, the language used in the exhibit has been studied for being understandable by the general public.

The other part of the exhibit is composed by an itinerary divided into four thematic sections, with panels that show how the geodiversity features determinate the value of natural and cultural heritage.

The aim of this exhibit, that can be moved in various places as itinerant exhibition, is the encouragement to a “global” reflection on man-nature connection, with tangible examples of adaptation to climate change, sustainability in the use of georesources and historical research activities, which allow a balanced development of the territory.

Key words: UNESCO Global Geopark, Sesia Val Grande, Geoheritage, Geotourism, Sustainability

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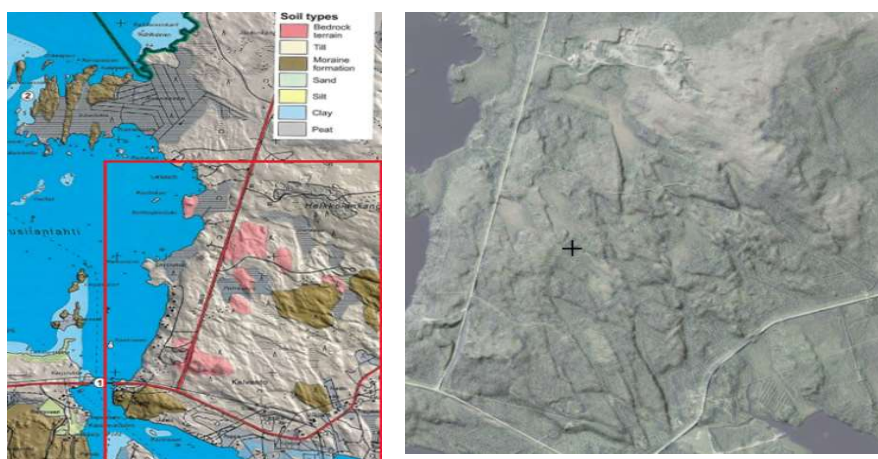
Email: *arianna.negri@edu.unito*

SUBGLACIAL MURTOO LANDFORMS AT KAIVANTO AREA IN ROKUA UGGP

Jari Nenonen, Geological Survey of Finland/ Rokua UNESCO Global Geopark

The LiDAR elevation model has allowed accurate study and observation of geomorphological formations. A few years ago, a new triangular form was observed in Finland and Sweden, which was named Murtoo after its discovery. Murtoo fields have been found to be connected with eskers and have five common form types in Finland, of which triangular is the most common. Murtoos are subglacial depositional forms which consist of silt/clay, sandy, and gravelly diamicton and are covered by stratified glaciofluvial material. Murtoo sediments are produced by pulsed, sediment-rich flows with big subglacial meltwater flow during deglaciation with only weak glaciotectionic deformation. Murtoos may provide new knowledge for glacial modeling and also increase understanding on how current glaciers will behave in the warming climate.

In the easternmost part of the Rokua Geopark, Murtoo formations can be seen in the Kaivanto area. They have previously been described as hummocky moraines, but according to the exact LiDAR interpretation, they can be found to be Murtoo forms. In this Murtoo field, the formations are mainly triangular in type. They consist mainly of grey basal till covered by loose, sandy, and stony till. Their deposition is associated with the nearby Rokua esker running through the island of Manamansalo south from Kaivanto.



Quaternary map and aerial photo with LiDAR-elevation model of the KaivantoMurtoo formation area (inside red lines).

GEODIVERSITY AND GEOHERITAGE OF THE PRÍNCIPE ISLAND (WEST AFRICA)

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The Príncipe Island (coordinates 1°36'N - 7°23'E and an area of 136 km²) is located at the coast of west-central Africa and is part of the twin-island state of São Tomé and Príncipe - the second smallest country in Africa. The islands are known as the "Galapagos of Africa" due to the high number of endemic plant and animal species. They are a melting pot of influences from different countries and have a unique and authentic character in terms of language, culture, gastronomy, traditions, biodiversity, and geodiversity.

The geoheritage of São Tomé Island has been previously described and assessed, based on a qualitative approach that relates the scientific value and the public perception assigned to each geosite (Henriques&Neto, 2014, 2019). The same method was applied to the geoheritage of the Príncipe Island, therefore complementing the knowledge about the geoheritage of the whole country.

The Príncipe Island is 31 million years old, being the oldest volcanic island of the in the Cameroon Volcanic Line. It has an area of 142 km² and a population of only about 8420 people. Rainforest covers the island's basaltic peaks and slopes, cascading down to spectacular white sand beaches and turquoise waters surrounded by intense green palm trees. In 2012, the Príncipe Island was declared UNESCO World Biosphere Reserve. However, there is a great lack of knowledge about its geodiversity and geological heritage.

The aim of this work is to describe and assess the geoheritage of the Príncipe Island based on seven selected geosites that represent the major geological characteristics of the island, which can support current geoeducation activities and future geotourism initiatives: Papagaio Peak; Oquê Pipi Waterfall; Agulhas Bay; Banana Beach; RoçaTerreiro Velho; RoçaSundy; and BomBom Islet.

By integrating the geodiversity dimension to the biodiversity dimension, this research intends to display a holistic vision of the natural heritage of the Príncipe Island and to contribute to assist United Nation's goals regarding Small Island Developing States.

THE INTEGRATED ANALYTIC PLATFORM FOR TERRITORIAL INTELLIGENCE SMART REGION, AN EXAMPLE IN OESTE ASPIRING GEOPARK (PORTUGAL)

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Smart Regions are the foundation of building regional sustainable planning, promoting knowledge-based territorial development, through continuous learning from social, economic, environmental, business, community ecosystems. A smart region is one that solves tasks and challenges through the knowledgeable application of new technologies, the organization of processes and wise and future-proof decision-making. The Oeste aspiring Geopark (OAG) has developed its activity based on local, regional and even national partnerships. As a result of such partnerships, it has been possible to develop projects in an integrated way, where the private sector interacts with municipalities and universities.

One of the partnerships is the participation of OAG in the Integrated Analytic Platform for Territorial Intelligence Smart Region project. This project is promoted by the Oeste Intermunicipal Community, an entity that comprises the OAG' municipalities and 6 others. This Smart Region project was implemented by NOVA Information Management School, and aims to develop capacities for collecting, storage, processing and analyzing data from operational systems and networks of municipal sensors. This data is also integrated with data generated by the territories, taking advantage of the creation potential of analytical capacities generated by other information platforms. Based on these data, the project contributes to the definition of planning measures, management infrastructures improvement, tourism and hospitality management at an inter-municipal scale, following a "Smart & Sustainable Tourism" approach.

The OAG benefits from a set of essential monitoring data, such as the lodgings, geosites, museums and interpretive centers carrying capacity. Also, it will be possible to evaluate the direct and indirect economic impacts of the oAG to an entire region, the residents and visitors mobility flows, among other parameters.

With this data, the management structure of the OAG can have a global vision of its territory, but above all, can plan the future, based on reliable data. This will imply less costs, and integrate with existing information platforms. But, considering that these data are the same used by the municipalities for their daily management and definition of future strategies for the territory, the process of defining joint territorial management strategies is facilitated, centered on a single methodology and accepted by the main agents of the territory.

The Integrated Analytical Platform for Territorial Intelligence Smart Region, is not only a pioneer technological project in Portugal, it is also an example of how the UNESCO Global Geoparks and aspiring territories can benefit from networking at regional level.

SOME GEOLOGICAL FEATURES AND VALUES OF LANG SON GEOPARK

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Viet Nam Institute of Geosciences and Mineral Resources (VIGMR)

Lang Son Geopark is an ancient land with a history of geological evolution at least about 500 Ma. There are all kinds of soil and rock here, from magmatic, metamorphic, and terrigenous to carbonate ones. Lang Son Geopark consists of 3 main structural units: 1). Bac Son Anticlinorium-Limestone block - where geological formations from Cambrian to Permian are exposed; 2). Song Hien hinterland rift-originated superimposed depression - where the early-middle Triassic geological formations are exposed, especially the co-sedimentary eruptive formations with the early Triassic acid composition; and 3). An Chau hinterland rift-originated superimposed depression - where geological formations from early Triassic to Paleogene are exposed, especially continental eruptive rock with acid composition aged J3-K and continental volcanic eruptive rock with base composition age K-p. Along with the tectonic context, such a long, complex, diverse, and continuous geological evolutionary history is an equally long, diverse, and continuous life evolutionary history, leaving extremely rich sets of paleontological fossils such as Ammonites, Brachiopods, Bivalves, Anthozoans, Ancient Fishes, Foraminifers... Moreover, crossing both of the above-mentioned hinterland rift-originated superimposed depressions is the Cao Bang-Tien Yen deep shear fracture zone along which a series of Tertiary and Quaternary pull-apart basins such as Lang Son and Na Duong have been formed. Particularly, in the Na Duong basin, coal-bearing continental sediments of alluvial-lacustral-bog origin over 600m thick have been deposited with a rich and unique set of fossils of freshwater and terrestrial flora and fauna, including varieties/species of mollusks, snails, vertebrates such as fish, turtles, and crocodiles, and especially mammals such as thú than, rhinoceros, and primates..., traces of leaves, pollen spores, and especially fossil wood forests..., contributing to the reproduction of such a volatile tropical ecosystem approximately 40-20 Ma. that many scientists called it a "special window into the Eocene epoch from Southeast Asia". It is not surprising that Lang Son Geopark is also one of the oldest and most unique cradles of prehistoric people in the entire territory of Vietnam with archaeological relics and artifacts from about 500 Ka. (Homo Erectus remains), 125 Ka., 40, Ka., 10 Ka., 4 Ka. and continuously to the present day, including famous archaeological cultures such as Bac Son Culture (about 11-5 Ka.), Mai Pha Culture (about 4-3 Ka.), etc. Lang Son Geopark is currently home to 7 ethnic minorities with indigenous cultures imbued with their own identity and also shows a very unique interference between them and the Red River Delta culture with its famous Đạo Mẫu (the worship of mother goddesses). Lang Son Geopark will certainly be a very distinctive and worthy member of the UNESCO Geopark Network.

DAK NONG UGGP'S GEOPARK EDUCATIONAL ACTIVITIES FOR THE YOUTH

Trần Nhị Bạch Vân, *Official at International Cooperation Division, Foreign Affairs Department, DakNong Province, Vietnam*

Dak Nong Geopark (Vietnam) has been recognized as a UNESCO Global Geopark in July 2020. To further promote its heritage to local people, especially to the youth for better understanding of conservation and development, DakNongGeopark Management Board has cooperated with many partners to diversify the activities for the local youth. In details, about the educational material: Currently, there are many kinds of documentation at 7 – 15 years old, such as: comic book, legendary book, rock box, school information panel. The space of geopark education is not only in the classroom but also outside the classroom, which brings pupils closer to the nature. The educational topics is various from geological features, environmental protection, recycling workshop to how to live in harmony with the nature,...

Moreover, after training for students we also co-host with other geoparks for Geopark online exchanges. In such activities, students are encouraged to share about their geopark beauty as well as learning from other geopark's characteristics.

Additionally, DakNongUGGp Management Board in coordination with DakNong Department of Education and Training to annually hold Geopark Tour guide Contest for High and Secondary School students.

RESEARCH ON THE CONSTRUCTION AND DEMONSTRATION OF LOW-CARBON SCENIC AREA: A CASE OF ZHAIXIA GRAND CANYON LOW-CARBON SCENIC AREA OF TAININGUGGP

Chen Ningzhang, *Taining Global Geopark Administrative Committee, China*

Pursuing green and low-carbon development is of great significance to implement new development philosophy, ecological conservation and build a beautiful China. Taining UNESCO Global Geopark launched a pilot project of low-carbon scenic area construction and demonstration in Zhaixia Grand Canyon. This pilot project has promoted the upgradation of scenic area, and transformed the economic growth model to a to a low energy consumption, low carbon emission and low pollution one. At the same time, a number of new policies have been made, which plays an active role in promoting the idea of low carbon. By providing a low-carbon touring experience to visitors, the scenic area has built an image of good ecological environment, which has a demonstration effect in promoting the sustainable develop of global geoparks.

**NISYROS ASPIRING UNESCO GLOBAL GEOPARK:
ACTIONS FOR THE PROMOTION OF ITS GEO-CULTURAL HERITAGE**

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NisyrosGeopark is a candidate for inclusion in the UNESCO Global Geoparks Network due to its exceptional geological, natural, and cultural characteristics. It is located in the Southeastern Aegean and spans an area of 481 km², encompassing the active volcano of Nisyros and surrounding islands. The geopark is closely tied to its volcanic origin and is situated at the southeastern end of the South Aegean Volcanic Arc, a significant active volcanic arc in the world. This location gives rise to a unique terrestrial and submarine natural landscape. The geopark features 24 geosites that showcase its geological history.

Visitors can witness the impressive collapse caldera, volcanic domes in the western part, and various layers of lava, ash, and pyroclastics, which provide evidence of its long geological past. The active hydrothermal field of the craters and numerous hot springs along the coastline reflect the existing hydrothermal activity. The submarine area of the geopark is also integral to its evolution and formation, attracting international scientific research aimed at exploring active volcanic environments. This makes the geopark a distinctive natural geological laboratory within the wider Eastern Mediterranean region.

In addition to its geological characteristics, the Geopark of Nisyros boasts a rich cultural heritage. Despite its small size, the area has been continuously inhabited for several millennia. The island is directly associated with the myth of Gigantomachy and has inherited cultural elements from various peoples who conquered and controlled it over time. Fortresses like Paleokastro and the castle of Mandraki, along with ancient settlements, churches, and monasteries from the Byzantine era, contribute to the historical legacy of the region. These cultural landmarks shape the traditions, customs, and tangible and intangible cultural heritage of the local people.

The Management Body of the NisyrosGeopark, along with its scientific team, is actively working to strengthen the candidacy and promote the geodiversity of the area. They have implemented various educational initiatives targeting the general public and educational institutions. These efforts include the installation of explanatory signs, the development of the Nisyros Volcano App, the creation of a modern printed brochure dedicated to the geosites, informative talks, educational workshops, summer schools, and media promotion. These actions aim to enhance awareness and understanding of the geopark's unique features and engage residents and visitors in its geological and cultural significance.

DEVELOPMENT OF TUBA GEOTRAIL AS THE LATEST GEOPRODUCT FOR GEOTOURISM IN LANGKAWI UNESCO GLOBAL GEOPARK

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Pulau Tuba, the third largest island in Langkawi UNESCO Global Geopark (LangkawiUGGp), has yet to be successfully developed as an important tourist destination, despite being just approximately 15 minutes by boat from the main island of Langkawi. There are many natural attractions on Pulau Tuba, particularly those that are connected to the island's diverse geology, biodiversity, and stunning scenery. Because of the ongoing rapid growth on Langkawi's main island, Pulau Tuba remains ignored and marginalised. So far, community based tourism development in Langkawi UGGp has been focused on a few key destinations on the main island of Langkawi, leaving limited prospects for more marginalised areas and communities of Pulau Tuba to benefit from. This paper is about the development of the Tuba Geotrail, which is the latest geoproduct on geotourism and can help spread tourism destinations and reduce the pressure on the main island, where the main attractions and facilities have been fully developed for geotourism. The research approach is based on the identification, evaluation, and recommendations for sustainable development of natural heritage resources (geology and biology) as well as cultural heritage and local traditions. The development of a guided geotrail approach included identification of pit stops or touristsites, representing geosites, interesting geological features, scenic landscapes, biological habitats, cultural and historical sites, and island community life. Each geotrail has an integrated heritage-based narration of Tuba Island's special features.

INVASIVE ALIEN SPECIES AS A NATURAL THREAT TO BIODIVERSITY IN THE LAND OF EXTINCT VOLCANOES

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The Kaczawskie Association - Mściwojów 45a, 59-407 Mściwojów,

A survey of local residents on natural hazards shows that they are most concerned about drought and flash floods - as consequences of climate change. From late spring to early autumn, long periods of drought are interrupted by violent storms with intense precipitation, occurring very locally and causing flash floods. Such an outcome was expected given that some people are involved in agriculture and take water from their own well.

The question on invasive alien species showed that, on the one hand, the topic is not foreign to some, but on the other hand, the concept of 'invasive alien species' is not fully understood. The relatively recent regulations and procedures described mean that people do not yet know how to deal with them. The benefits of certain species for e.g. beekeepers overshadow the real threat to the environment.

In the area of the Land of Extinct Volcanoes Geopark, of the species posing a threat to the EU, but widely distributed, the most common are: purple jewelweed (*Impatiens glandulifera*), Sosnowski's hogweed (*Heracleum sosnowskyi*) and raccoon (*Procyon lotor*).

From the list of species threatening Poland and widely distributed are: the wild cucumber (*Echinocystis lobata*) and various species of knotweed (*Reynoutria* sp.).

The very common canadian goldenrod (*Solidago canadensis*) is also an invasive species. Its dominance in certain areas has effectively reduced the landscape value of our area.

In order to familiarise residents with this topic, we organised a meeting with Wojciech Solarz (associate professor at the Institute of Nature Conservation PAS, member of the Scientific Forum on Invasive Alien Species at the European Commission since 2015). The meeting was very intimate, which only shows how many more awareness-raising and educational actions we still have to carry out.

It seems that the only way to reduce the range of invasive alien species will be to educate local people and engage them to reduce the presence of these species.

What are our plans?

- involve schools in pulling out plants before the seeds are released
- encourage residents to plant native perennial species and shrubs.

We are curious to see how European geoparks deal with these species - already widespread in Europe of our climate zone, after all. We hope to be able to exchange experiences in this field as part of our cooperation on the preservation of primary biodiversity.

VALORISATION OF GEOLOGICAL HERITAGE SITES IN THE LAND OF EXTINCT VOLCANOES GEOPARK BASED ON THE EXAMPLE OF THE CLOSED BASALT MINE "WILCZA GÓRA"

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In 2018, the Kaczawskie Association, the coordinating entity of the Land of Extinct Volcanoes Geopark, commissioned a Geological Inventory necessary for application to the UNESCO Global Geoparks Council. The inventory included a geological and geomorphological description of the area and a description of 130 geopoints. The inventory also included a valorisation of all the sites. The scientific, educational, ancillary, aesthetic value, accessibility and state of preservation were assessed. One of those places is Wilcza Góra. The hill owes its present-day appearance to natural processes, while its asymmetrical shape is the result of mining activity. An older quarry was located on the western side of the culmination and was exploited at the turn of the 19th and 20th centuries. In 1959, an open-air nature reserve "Wilcza Góra" with an area of 1.69 ha was established in the former quarry. Until 2019 there was basalt active mining in the eastern part of the hill. The deep excavation was inaccessible to visitors, but perfectly showed a cross-section of the former volcanic chimney and the three phases of volcanic activity. In 2022, recultivation was completed and the mine was opened to the public. Wilcza Góra demonstrates great educational value. It represents the so-called Lower Silesian Basalt Formation which consists over 300 individual occurrences of basalt and related rocks formed in the time interval from the Eocene to the Middle Miocene. The lavas sometimes contain pieces of Permian, Triassic and Cretaceous sedimentary rocks of the surroundings and older lavas. In addition, numerous xenoliths of the Earth's mantle, enclaves of olivine a few centimetres thick and volcanic breccias occur within the volcanites. Of particular note are the undisturbed sections of basalt columns standing upright, the concentric arrangement of fractures known as the "basalt rose" and the basalt veins cutting discordantly through the sandstone. The Kaczawskie Association had been making efforts for years to have the site sold to the Municipality of Złotoryja following the end of mining and recultivation, which was successful. The recultivation of the quarry was carried out in the direction of agriculture, forestry, green areas, nature with recreational and educational functions and industry. The resulting infrastructure in the recreational and educational area has opened up part of the closed quarry. As a result, the accessibility of the site has increased significantly, with the possibility of fully using its educational potential. The aesthetic value and general condition of the site has also increased, including the reserve section, which was largely covered with plants. The activities have meant that the site is today the highest ranked geopoint in the Land of Extinct Volcanoes Geopark. The example of Wilcza Góra proves that it is necessary to update the valorisation of geopoints in geoparks.

VOLCANIC LANDSCAPES, LANDFORMS AND FEATURES IN EUROPEAN UGGP: AN INITIATIVE AIMING THE PROMOTION OF GEOTOURISM AND GEOLOGICAL HERITAGE

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Old or young, extinct, dormant or active, calm and relaxed or violent and explosive, small, big or super-big... those are the volcanoes in Europe and the World. Some volcanoes live in European Geoparks, those special territories designated by UNESCO where Man meets Nature, walking together and aiming the development and well-being of local communities, with respect to natural values.

Volcanism is undoubtedly the most spectacular and fundamental geological process on Earth: it is responsible for the formation of our planet “Gaia”, oceans and atmosphere. Occasionally volcanoes wake up in a bad mood, remind Man that “we make the rules” and can impose significant hazards to people living on and around them.

Well, but what is a volcano? Voxpopuli would simply say that a volcano is “a mountain that spits fire, ashes and stones”, thus being a cone or edifice, more or less impressive, that expels lava from time to time. Nevertheless, a more scientific approach would term volcano as “a place at the Earth’s surface, where arrival of volcanic products occurred”, independently of being a mountain, a depression or a simple crack at surface. Thus, the term “volcano” is applied to individual vents (like craters, measured in meters), or volcanic edifices such as polygenetic volcanoes measured in kilometers, or to volcanic fields, measured in hundreds of square kilometers. A key issue, when dealing with volcanoes, is to consider them as extinct - with no eruptions in the last tens of thousands of years – or active (or potentially active), meaning that they have erupted in Holocene times, or the past 11,700 years. Active volcanoes can be either dormant (“sleeping” in-between eruptions and expected to erupt again in the future), or in activity, meaning with an on-going eruption with the extrusion of lava (as pyroclasts or lava flows) and gases.

Many volcanic landscapes, landforms and features are known worldwide and are iconic places that become important tourist destinations: Etna Volcano (Italy) and Giants Causeway (Ireland), Mt. Fuji (Japan), Yellowstone National Park, (USA), the Andean Volcanic Arc (South America), Oldoinyo Lengai (Tanzania) and Rotorua Caldera (New Zealand), plus many oceanic islands, like Hawaii and the Macaronesia Islands (e.g. the Azores, Canaries, Cape Verde and Madeira islands) are among those places. Visitors are attracted to volcanoes by their scenic views, the breathtaking environment and the “wow pictures” that volcanoes offer. But increasingly, it is the availability of those areas to provide positive experiences and at the same time offer local and genuine products and services – with strong engagement with the sustainability of these places – that plays a major role in the attraction of such volcanic areas. This is why geotourism, offered under the umbrella of UNESCO Global Geoparks (UGGp), plays such an important role in the sustainable development of those territories.

The present work shows to the geoparks community worldwide an e-book produced by the Working Group “Volcanic Areas” of the European Geoparks Network, highlighting the main volcanic characteristics of the UGGp in Europe. It includes territories with active volcanism or with significant assemblages of Cenozoic volcanic rocks, as well as geoparks that, even with just a few or very old volcanic rocks, include volcanoes on their public interpretation and communication tools. This book, available on-line is another networking initiative among the European UGGp, aiming the promotion of geotourism and geological heritage of such territories.

SPATIAL ANALYSIS OF THE GEOGRAPHICAL AXES OF TANGIBLE AND INTANGIBLE CULTURAL HERITAGE IN THE SENSE OF DELIMITING A POSSIBLE CARPATHIANGEO PARK

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GIS being a powerful tool, as an essential element, can contribute to valorize of the existing authentic culture, including the tangible and intangible heritage in the Maramureș area, one of the most authentic cultural value areas of the country. The principle of the study being, through the approach based on spatial thinking, to highlight the tangible and intangible geographical axes of cultural heritage, as a preliminary analysis of the territory. The main purpose of this study is to provide support for the development of tourism within the highest-level of protected area as the Carpathian Geopark and to establish a hierarchy according to their cultural capacity of the territory, to indicate the existing potential, that can be considered in the process of supporting geopark status. To this end, the following specific objectives have been set: i) define the principal geographical poles in which the community live and conserves their cultural identity; ii) spatial representation of cultural heritage geographical axes; iii) identify the connection between the inner and outer axes. These objectives were achieved through the spatial analysis method using geoinformation systems (GIS) in ArcGIS Pro. The result itself shows a strategic geographical of tangible and intangible cultural heritage sites, the principle and secondary geographic cultural axes of the studied area linking the inner and outer networks. It provides a possibility, a long-term development perspective, materialized in a development cultural heritage axis suitable for a geopark.

EFFORTS TO CONSERVE AND UTILISE SEAMOUNT-TYPE LIMESTONE AT MINÉ-AKIYOSHIDAI KARST PLATEAU GEOPARK, JAPAN

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Miné-Akiyoshidai Karst Plateau Geopark is located in western Japan and is a basin area surrounded by mountains with elevations lower than 700 metres. It was certified as a Japanese geopark in 2015, and is working towards being certified as a UNESCO Global Geopark.

The geopark has an area of 472 square kilometres, of which approximately 100 square kilometres is Upper Carboniferous to Permian limestone. The limestone was formed from coral reefs that grew on the top of seamounts near hotspots far from the land, rather than coral reefs that grew in coastal areas. Therefore, sediment from the land did not mix in with the coral reefs, resulting in the high purity of the calcium carbonate in the limestone. This allows the limestone to be easily used for industrial purposes, and is thought of as one of the reasons for the development of mining and quarrying as the main industries of the local area. The seamounts that carried the coral reefs migrated to the continent over a period of approximately 80 million years on an oceanic plate. Since the coral reefs formed closer to the surface of the ocean as the water depth increased, the limestone holds a continuous record of sea levels and climate changes during this time. This limestone is significantly unique and valuable geologically, especially as the coral reefs were not recycled into the Earth's deep interior with the oceanic plate at the trench, but accreted on to the continent and later became exposed on the surface. This has been studied and reported by Nakazawa and Ueno (2009) and Wakita (2019), amongst others.

In addition to such limestone, there are various geological and geomorphological heritages such as a coal seam (anthracite) of the Late Triassic Period and copper and silver deposits associated with igneous activity of the Cretaceous Period. The geopark protects these various heritages whilst utilising them for sustainable tourism.

The usage of limestone within the geopark differs based on its location relative to a river that runs in a north-south direction through the centre. Part of the eastern side of the karst plateau is registered as a Special Natural Monument. As a result of the geopark's activities, the local Board of Education, which is a member of the geopark's governing body, formulated a Conservation and Utilisation Plan in 2022 to better manage and utilise the Special Natural Monument. The plan addresses the issue of vegetation in some of the caves that are used for tourism, which is thriving due to artificial lighting. The Board of Education, in close cooperation with the geopark management body, is conducting a demonstration experiment to restore the original cave environment.

A major aspect of Miné-Akiyoshidai Karst Plateau Geopark's sustainable tourism is the daily geotours, where local residents who have received training as geoguides encourage participants through asking questions to consider how we can strike a balance between conserving and utilising limestone, while viewing limestone (marble) that is used as stone material and the open-pit mining of limestone from a distance. These geotours start at the geopark's base facility and do not require participants to book in advance, making it easy for tourists to take part in. There are plans to further develop the geotours by incorporating electric tuktuks and bicycles.

TRANSNATIONAL UNESCO GLOBAL GEOPARK FORUM – THE BENEFITS OF KNOWLEDGE SHARING, NETWORKING, AND A PARTNERSHIP BASED APPROACH

O'Connor, Cuilcagh Lakelands UNESCO Global Geopark, UK/Republic of Ireland

The Transnational UNESCO Global Geopark Forum was established in 2019 in an effort to bring together the four Geoparks operating on a transnational basis within in the UNESCO network. These are;

<i>Austria & Slovenia</i>	<i>Karawanken / Karavanke UNESCO Global Geopark</i>
<i>Germany & Poland</i>	<i>MuskauerFaltenbogen / ŁukMużakowa UNESCO Global Geopark</i>
<i>Hungary & Slovakia</i>	<i>Novohrad-Nógrád UNESCO Global Geopark</i>
<i>Ireland & United Kingdom of Great Britain and Northern Ireland</i>	<i>Cuilcagh Lakelands UNESCO Global Geopark</i>

Over the past number of years, the group have established itself with expanded representation from each Geopark, a share set of actions, a defined terms of reference for the operation of the forum and regular networking opportunities through quarterly meetings.

The Group represents the strong partnership in sharing ideas, experiences and best practice in context of working on a cross border basis. This presentation will discuss the important of networking and a partnership-based approach between Geoparks and the benefit of knowledge sharing specifically when working on a transnational basis. This presentation will also give a unique insight into the opportunity presented by working on a transnational collaborative basis. The Transnational Geoparks will be represented at the presentation.

**CUILCAGH LAKELANDS UNESCO GLOBAL GEOPARK
THE ROLE OF GEOPARKS AND GEOTOURISM WITHIN THE REGENERATIVE TOURISM CONCEPT**

O'Connor, Gráinne, Cuilcagh Lakelands UNESCO Global Geopark, UK/Republic of Ireland

Cuilcagh Lakelands Geopark, established in 2001 has evolved significantly over a twenty-year period. One of the most significant developments resulted with the Geopark crossing international boundaries into the Republic of Ireland in 2008 to become the world's first transnational Geopark. This expansion resulted in a Geopark representing a myriad of communities, landscapes and cultures governed under two different governmental jurisdictions. This, of course, presented challenges but in tandem many successes through stakeholder engagement, conservation, geodiversity, education and geotourism.

Geotourism has established itself as an important conduit for regeneration, partnership, and economic development in these rurally isolated border communities for many years. The Geopark has pioneered the Geotourism product. This has been particularly important in the sustainable development and regeneration of the communities that live in this cross-border area. In more recent years the concept of regenerative tourism has become increasingly apparent in the tourism narrative. This encompasses the sustainability-based approach that all Geoparks strive towards.

The importance of seeing Geotourism as part of a wider living system creating conditions for people and places to thrive, where success is measured through the wellbeing of the people communities and places in which they live is central. Integral to this is the interpretation of the geology and how it has shaped these places. This is what Cuilcagh Lakelands Geopark strives to do encouraging and supporting communities to have a greater affiliation to the landscape and designation in which they live, visit and operate through the realisation of Geotourism. All this leads to a renewed stewardship and accountability by those individuals, groups and communities towards a more holistic and sustainable UNESCO Global Geopark, something which benefits the environment and everyone who lives and experiences it. This presentation will focus on the importance of Geoparks in delivering the principles of regenerative tourism, something which has for many years been central to the ethos and values of the designation.

THE BURREN AND CLIFFS OF MOHER UNESCO GLOBAL GEOPARK - EDUCATION WITH SIMPLIFICATION OF SCIENTIFIC KNOWLEDGE ACCESSIBLE TO THE GENERAL PUBLIC

O'Farrell Seán

The story of each Geopark is a complex and the science behind it may not as easy to comprehend for a person who does not hold a degree in geology, archaeology or ecology. Therefore to educate and connect with the general public and to hold the average 8.25 second attention span, it is crucial to breakdown the science into a way that they can understand, digest, interact with and enjoy.

The Burren and Cliffs of Moher UNESCO Global Geopark aims to make information about their Geopark accessible and understandable to the general public through various forms of media. They aim to tell the 330 million year old story of the Burren in a visually compelling manner with the support of graphics and audio-visual assets.

In addition to the regular communication channels that they use such as social media, local radio and press and their website, they have also been developing The Burren Podcast to capture people's attention and to connect them to the Geopark when they are on the go, doing their daily errands or simply wish to re-connect with activity and people of the Geopark while abroad. They are also working with a local animation company on several short clips that illustrate the formation of the geopark, the fossils that can be found in the Geopark, plate tectonic movements and more.

The Burren and Cliffs of Moher UNESCO Global have incorporated many interactive features to their website to facilitate international and domestic tourists who visit the Geopark.

Many of these features are multipurpose and can be used for education, travel or general entertainment. They look forward to sharing these features and the rest of their bespoke communications projects with you at the 10th International Conference on UNESCO Global Geoparks 2023 in the The M'Goun UNESCO Global Geopark, Marrakech

COMMUNICATION, COLLABORATION AND COMMUNITY: EXPERIENCES OF GEOSCIENCE PUBLIC ENGAGEMENT AT THE NATURAL HISTORY MUSEUM, LONDON

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The Natural History Museum, London is a location of one of the British Geological Survey's (BGS) offices. Located within the UK's most visited indoor attraction with over 4.5 million visitors in 2022, the BGS offices offer a prime location for the communication of geosciences. Until recently, a 'Geology Shop' catered for museum visitors, students, geologists and researchers. In addition to sales, the 'Geology Shop' provided geological information for a wide range of audiences, each one requiring different levels of science communication, which is an integral part of successful public engagement. The interactions and experiences provided were integral to building a solid community of people who wanted to engage further.

Many public engagement methods were used to engage people with different geology knowledge levels and tailored based on the level of the audience. For those new to geoscience, the use of rock and fossil hand samples with explanation of interesting facts was a great hook. If they purchased items, as much information as possible was offered for them to enable research in their own time. Additional fun activities were also provided that could be undertaken in their own time such as cut-out volcano models.

In addition, permanent mini-exhibits that changed monthly, targeted at those with more established knowledge. This included a 'Spotlight On' shelf, which provided an overview of an interesting geological feature or location in the UK and the material that could be purchased of the area such as books and maps. A more detailed 'Themed Table' delved into a particular theme of geology, such as 'Fossils of Southern England'. The table would feature products for sale, but its unique feature was that a collaboration with the museum's handling collection curator meant that specimens were put on display for people to interact with.

Having a BGS presence within the Natural History Museum provides huge opportunities for the communication of geoscience. Large visitor numbers with a keen interest in the natural world mean that key geoscience messages can be conveyed easily and with significant impact. What makes this location particularly unique are the resources provided by the Natural History Museum with whom BGS has a strong relationship and one that has the potential to be used to even greater effect in the future.

INQUIRY-BASED LEARNING PROGRAM FOR STUDENTS AND THEIR EFFECTS THE CASE OF MT. CHOKAI-TOBISHIMA ISLAND GEOPARK, JAPAN

Marekazu Ohno, *The Council of Mt. Chokai and Tobishima Island Geopark*

Educational activities are important in building a sustainable society, and are also a very important element of the geopark program. In this presentation, I would like to introduce an education program "an inquiry-based learning program" conducted in Mt. Chokai and Tobishima Island Geopark and their results. Mt. Chokai and Tobishima Island area is an aUGGp located in the northeastern part of the Japan, which has about 2800 km² (including in the sea) and 200,000 population. Main geological highlights of the area are Tobishima Island which was landed by uplift continuing about 10 million years ago and unique landform formed by a sector collapse of an active volcano of Mt. Chokai. In this area, we carried out to local junior high-school students with 12 -13 years old the inquiry-based learning program which investigates the value of geopark's sites by collaborating with a local junior high school (in Yuza area) in 2022. From April to June, students learned general information about the geological, natural and cultural sites by lectures and fieldwork provided from a geologist and geopark guides. After July, the students formed several groups and each groups set research a theme for investigating the sites. And then, they worked until November to get conclusions on their theme. Part of their achievements were announced to the local people at the event "Learning Research Presentation by Local Students" hosted by the Council of Mt. Chokai and Tobishima Island in December. We conducted a questionnaire survey about the geopark program to the students before and after implementing this educational program and, by comparing them, verified the impacts, effects and influences of this education program on the students. First, we were asked students to choose their image of the geopark from 12 keywords which consist "earth science", "natural environment", "agriculture", "history and legend". Before experiencing this program, students tended to choose earth scientific words as well as natural environment; e.g., springs, volcanoes/eruptions, strata/rocks, and topography. But after experiencing the program, students who choose keywords related to people's lives and intangible heritages such as "agriculture," "folk tales/legends," and "local cuisine" were increased. The number of students who can (somehow) explain "what the Geopark program is" and that they enjoyed learning about the Geopark also increased. On the other hand, the number of students who felt that "Geopark learning is difficult" increased, and the number of students who were interested in the Geopark program decreased.

The results of the questionnaire suggest that learning program using the geopark site deepened the students' understanding of local resources and broadened their understanding of the geopark philosophy. However, it is also true that this learning program disappointed some students with the geopark. Further improvement of learning methods is necessary for young generations to discover the value of local resources and raise awareness of conservation of local resources.

EXPLORING THE RELATIONSHIP BETWEEN LEGENDS AND GEOLOGICAL SCIENCE FROM THE RUNA SHIMI WORLDVIEW

Oña Lisbeth^{1}, Rengel Patricia²*

- 1. Pangea Master Program*
- 2. Imbabura UNESCO Geopark*

The Indigenous people of the Ecuadorian Andes, including those in Imbabura UNESCO Geopark, have a unique spiritual connection with nature. Their language, Runa Shimi, is more than a means of communication; it is the vessel that embraces their beliefs about nature's essential role in human life. This Indigenous Andean worldview recognizes the interconnection between God (Wiraqucha), nature (Pachamama), and humans (Runas). This relationship is centered on respect for each other. The Runas believe rivers, mountains, stones, and stars are not just inanimate objects but also expressions of Pachamama's life. The Andean worldview is grounded in maintaining harmony between humans and nature through appropriate knowledge of the Andes expressed in their culture, social organization, and values. Ceremonies, practices, music, beliefs, and rituals demonstrate Runas' commitment to upholding solidarity and respect as part of their cultural identity.

Following the spirit of Runa shimi, myths and legends are fundamental to understanding humans' relationship and dependence on nature. According to the legend, the Earth was dark and lonely until thunder and lightning shook the world, creating cracks and unevenness that forced the river to flow with greater force, generating springs with different sounds of whistles and waterfalls with high and low-pitched voices. The legend of Mama Cotacachi exemplifies the essence of Runa shimi as well: "An old mountain in the shape of a woman decided to die to be reborn as the new Cotacachi. However, the renewed mountain fell in love with Imbabura Volcano, betraying her husband, Rucu Pichincha Volcano. Her son Yanahurco was born from an illegitimate romance, and they were eventually separated. Mama Cotacachi continues to weep to this day for the loss of her son, and the flow of her tears can be seen in the form of a river called Chumaví that runs down her face towards the lagoon". Both myths reflect the connection of Runas with Pachamama and the exchangeable characteristics from one group to another group.

The legends and myths do not necessarily correspond to scientific geological explanations. Nowadays, scientific knowledge makes it possible to offer geological interpretations that have been explained in legends. For example, the different geomorphology and landscapes due to thunder and lightning in the origin of everything myths may refer to the action of winds, seismic activity, and tectonic forces that shape the landscape in the Andean region. The waterfalls with high and low-pitched voices reflect the increase in river flow. The legend of Mama Cotacachi is related to volcanic activity in the area. The death of the ancient mountain geologically refers to the caldera formation because of the eruption of a volcanic dome that currently forms The Cuicocha Caldera Lake. Likewise, Cotacachi's attraction to Imbabura instead of her husband, Rucu Pichincha, could be related to the volcanic and seismic activity in the same territory, Imbabura province. If scientific-related explanations can be found in myths and legends, discrepancies also appear. For example, scientific studies indicate that the Cotacachi volcano is the eruptive center and the origin of a series of volcanic domes, including Cuicocha, but not the other way around, as established by the legend and is a widespread belief.

The Andean worldview is based on a respectful and profound relationship with nature and the cosmos. Indigenous peoples recorded the behavior of wildlife in myths, and spread the events in legends, which created deep knowledge of the Andes that is transmitted from one generation to another. Legends and myths are essential tools for sharing this perspective, and their interpretations should be considered as resources from geology. But legends remain speculative and not consistently scientifically accurate. The Runas use their language Runa Shimi to reflect their connection with nature, which is a fundamental piece of their cultural identity

Keywords: Imbabura Geopark, Runa-Shimi, identity, myths and legends, Geology

INTERNATIONAL EXCHANGE BY PLAYING THE“FOR WAN GEOLISM”CARDGAME

Mutsuki Osada, 1st year student, Kansai Gaidai University, Oki Islands UGGp (Japan)

I'm a first-year undergraduate of Kansai Gaidai University in Osaka, Japan. My hometown is Oki Islands, and I lived in the Oki Islands UNESCO Global Geopark until high school. I took classes about the Geopark from elementary school through high school. In one of the programs, the Geopark Exploration course in high school, students gain knowledge about Geoparks from the perspective of SDGs, and as part of the activities, we conducted a beach cleanup every year. It is impossible for students to pick up all the marine debris by themselves, so to encourage local people to participate in the activity together, our seniors at high school developed a card game to learn about the Geopark and the SDGs together.

The ocean and the sky are shared resources, and in order to achieve the SDGs the efforts of everyone on the planet are needed. The card game we created is called “For WAN GEOLISM”. ‘For WAN’ represents a connection of the Global Geoparks Network as one. ‘GEOLISM’ means the concepts of Geopark like the preservation, tourism and SDGs. It represents our desire to respect different ways of thinking and different cultures, and create a society that grows together in changing times. In order to overcome the problems that we have been facing together, it is important to be responsible for all the related problems. “For WAN GEOLISM” can make it happen.

Forexample, we used this card game when interacting online with students of Hantangang UNESCO Global Geopark in South Korea. Through the activity, we made two kinds of cards in different languages: Japanese and Korean, so that students from both countries were able to gain understanding of each other.

As a result, students exchanged a lot of information about Geoparks while having fun playing the game, learning about Geoparks in both regions and SDGs. By playing this card game, we were able to understand each other's "sense of values, way of thinking, and cultures". In the future, I strongly hope that this card game will be introduced into education and international exchange for geoparks around the world.

**A HISTORY OF NATURE'S VICTORY AT THE LESVOS PETRIFIED FOREST, REVEALED BY
STRATIGRAPHIC ANALYSIS OF PART OF THE SIGRI PYROCLASTIC FORMATION
(AKROXEIRAS ROAD CUT).**

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The Petrified Forest of Lesvos Island (Lesvos UGGp) is a Natural Monument of International value. Astonishing silicified tree trunks, branches and leaves pop-up from the different stratigraphic levels of Sigri Pyroclastic Formation. Several hundred meters of stratified tuffs and volcanoclastic sediments intercalate with soil horizons. The Formation presents a complex stratigraphy due to the multiple successive eruption events that formed it, and to the different generation mechanisms. The intense tectonism, however, complicates the stratigraphic interpretation of the volcanoclastic sequence and the reconstruction of the respective eruption history. The construction of the new Kalloni-Sigri road with several new road cuts has exposed a significant part of the Sigri Pyroclastic Formation. High resolution multi-proxy stratigraphic analysis has been conducted in order to establish temporal and spatial correlations, determine facies changes, determine the depositional palaeoenvironments of the basin and record the stratigraphic position of the different fossil tree trunk and leaf horizons and their taphonomy. To date, the detailed stratigraphic logging resulted in the recording of 16 units of secondary pyroclastic flows and volcanoclastic layers separated by 15 soil horizons. The latter represent stratigraphic hiatuses of at least 50 to 11.000 years. During these time periods multiple forests developed as indicated by the standing petrified tree trunks. Each of these forests was buried by low temperature pyroclastic material containing water. The trees due to the stressful conditions shed their leaves every time a new pyroclastic flow occurred. As a result, several horizons of fossilized leaves are found. The detailed stratigraphic logging of the respective sequence revealed a history of multiple catastrophic events but at the same time a history of victory. It is the victory of the life which managed to survive and thrive after each big disaster.

**CAVE OSTRACODA FROM GREECE AND GERMANY: A SCIENTIFIC COLLABORATION BETWEEN
UNESCO GLOBAL GEOPARKS**

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The university departments are "nests" of knowledge and innovation and through scientific research they provide geoparks with new information that can potentially be exploited for tourism. The "Program for the Promotion of the Exchange and Scientific Cooperation between Greece and Germany IKYDA 2022" and more specifically the joint project "Cave ostracoda from Greece and Germany: a pilot study for (palaeo)ecological and biogeographical collaboration" is a striking example of how scientific research can be combined with cooperation between UNESCO Global Geoparks. The scope of this project is the faunistic and ecological analyses of the ostracod fauna and its ecological implications in selected caves of Greece and Germany in order to set up a standard workplan for future joint studies. The project has focused to the most important touristic caves of the participating geoparks (Cave of the Lakes-ChelmosVouraikos UGGp, Altenstein Cave-Thüringen Inselsberg - Drei Gleichen UGGp). The sampling was carried out during joint visits of the Greek and German teams. Especially the research in the Cave of the Lakes has revealed a relatively rich taphocoenosis of ostracods and an evolution of the paleoenvironment which probably reflects climatic events. At least four different species have been retrieved from the sediments. Moreover, the processing of the samples revealed the presence of microplastics in the sediment of the Cave. These data will also help with the protection of the cave. The mutual visits provided the opportunity for discussions and knowledge exchange between the two teams and resulted in the signing of an MOU. Except for the scientific value of the project there is also an educational dimension. An important deliverable of the project is the delivery of popularized scientific material that will be used by the tourist caves and the two geoparks to prepare informative and educational material.

INDONESIA'S GEOPARK NATIONAL ACTION PLAN 2021-2025 INTEGRATED WITH SUSTAINABLE DEVELOPMENT GOALS/SDGS: LOCAL SOCIO-ECONOMIC IMPACTS

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The development of geoparks in Indonesia has been progressing rapidly in the last several years, as shown by the increasing number of UNESCO Global Geoparks (UGG), National Geoparks, and Aspiring Geoparks within the archipelago. To support geopark activities, as a regulatory framework, the President of the Republic of Indonesia has issued Presidential Regulation No. 9 of 2019. As its derivation, the Minister of National Development Planning/Head of the Ministry of National Development Planning issued the Minister Regulation No. 15 of 2020 on Indonesia's Geoparks Development Action Plan 2021-2025 that was integrated with Sustainable Development Goals/SDGs. The development of geoparks contributes to 11 out of 17 SDGs in Indonesia.

Our study reviews the development of geoparks in Indonesia, including the laws and institutions that support them, their impact on the local socio-economic of the surrounding regions through the development of geoproducts, geotourism and so on, as well as the challenges and efforts being made to continue their future development. The study starts by presenting the uniqueness of Indonesia's UNESCO Global Geopark, namely Batur, Gunung Sewu, Ciletuh-Palabuhanratu, Rinjani-Lombok, Caldera Toba, and Belitong. An analysis of local socio-economic contributions through geoparks development was made. The development of geoparks in the Gunung Sewu, Ciletuh-Palabuhanratu, and Rinjani UGG areas is indicated to significantly reduce unemployment rates. The decline in the number of poor people and the poverty rate is evident in almost all regions. In addition, the local community is more aware of the natural disasters and conservation aspects in almost all geoparks development areas.

4GEON PROJECT AS A TOOL FOR SHARING PLAYFUL GEOSCIENCE KNOWLEDGE

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Key words: Earth heritage interpretation; geopark; geoportal; geoschool; IGCP project; Pinterest

The IGCP-751 4GEON project launched in 2022 connects five diverse geoparks (The Barrandian National Geopark; Rio Coco UNESCO Global Geopark (UGGp); Colca y Volcanes de AndaguaUGGp; Ngorongoro LengaiUGGp and Bohol IslandUGGp) defined by its own (hi)story, geological and geomorphological phenomena, culture and local community. The most important event of the project was the Eastern Partnership conference and workshops, which took place in Příbram, Czechia, between August 29 and September 7, 2022. In several places in the Czech Republic (Barrandian National Geopark, Bohemian Paradise UGGp, etc.), project participants became familiar with the Czech concepts of geoscience research, Earth heritage interpretation, the use of virtual reality, the geoschool, mining tourism, paleontological sites, and geotourism products as well as with experiences from other geoparks and protected areas of the Eastern Partnership countries.

As the first planned output of the project, Barrandian National Geopark launched a geoportal (<https://www.geodeugame.com/en/>), several online workshops were also held, a project portal was created (<https://www.4geon.org>) and the project was intensively promoted among local residents and regional administrations by all involved geoparks. During the first year of the project implementation, several diverse activities were implemented, briefly described in the article "*Report of 4GEON: A Project of Four Continents Connected Through Playful Geoeducation*". In 2023, an online workshop was held, micro-projects are being created at partner geoparks in Nicaragua, Peru, Tanzania, and the Philippines and opportunities for financing them are being sought, geoeducation is being carried out, and feedback shared, a page was created promoting the project and all the geoparks involved in it on Pinterest (<https://cz.pinterest.com/4geon/>) and another project meeting of representatives of all involved geoparks is planned at the University of Hradec Králové and Barrandian National Geopark at the turn of September and October. At this meeting, it is planned, among other things, to familiarize the participants with the way of working on joint projects of the geoportal, the web portal of the project, Pinterest, and the use of other social media. Specific activities will be agreed which will lead to the further development of geoschools, geobus/geoship, and interpretation of Earth's heritage.

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doi: 10.30486/gcr.2023.1975145.1118

Acknowledgments

We gratefully acknowledge the team of the International Geoscience Programme (IGCP) for their support in the implementation of the IGCP project No. 751 (Four Continents Connected through Playful Geoeducation), which enabled the work behind this chapter.

LINKING ART, SCIENCE AND NATURE FOR ENGAGING THE COMMUNITY AND PROMOTING GEOCONSERVATION: THE CASE OF GEOPALCOS PROJECT FROM THE ASPIRING GEOPARK ALGARVENSIS

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Located in the southernmost region of Portugal, with a total area of 1381 km², the territory of the aspiring UNESCO Global Geopark Algarvensis encompasses the sparsely populated inner area of Loulé, Silves and Albufeira counties.

The significant geodiversity of this aspiring Geopark allows to document 350 million years of Earth's history and more than 20 thousand years of Human occupation's history. With a geological heritage of major importance, at national and international levels, it relies on geoconservation strategy linked to environmental education and awareness, to sustainable socio-economic development based on geotourism activities, involving local communities and contributing to the valuation and promotion of local assets.

This strategic vision gave origin to the Geopalcos project, a biennial multidisciplinary intervention program structured around the interconnection of Art, Science and Nature, enriching and stimulating the territory with different concepts and point of views. Designed with and for the people of the aspiring Algarvensis, the events of this project are created from the collaboration and participation between local populations and artists and scientists challenged to think the territory as a place of creation, reflection, disquiet and dazzle.

The basic idea is to lead a nature lover to discover art and science at the geosites, an art fan to wander through nature until the geosites and the paths of knowledge, or even a curious person to relate their knowledge to natural beauty of the landscapes.

The Geopalcos project has now presented two editions, the first one during summer 2021, and the second one during spring 2023. The activities materialized in both editions were unique and diverse, such as, site-specific performances, artistic installations, pathways-experiences, exhibitions, disciplinary intersections with manual arts, theatrical creations, concerts, workshops and training sessions, among other cultural and artistic events created by local artists, in collaboration and dialogue with the local community and scientists.

With 3125 participants, during the COVID pandemic, the first edition in 2021 included 12 concerts, 6 exhibitions, 7 workshops, 12 walking tours, 4 artistic installations, 4 roundtables, 11 educational activities and 3 theatrical creations, involving overall more than 180 artists. The second edition in 2023 involved 2420 participants distributed through 6 concerts, 3 exhibitions, 6 workshops, 3 walking tours, 4 artistic installations, 6 educational activities and 1 theatrical creations, involving overall more than 63 artists.

The Geopalcos project is now gradually asserting itself in the territory, not only due the less or the more number of artists, participants or events held, but for the increasingly involvement of the local community in the project, since it had a mean of 83 participants per activity in the second edition against only 53 in the first edition.

One of the consequences of the Geopalcos program is assuming itself as an excellent tool for the dissemination of the holistic concept of a UNESCO Global Geopark among the local community, and also among the general public, since once visiting the Algarvensis territory with the Geopalcos as the main motivation, general public will get contact with the aspiring Geopark Algarvensis project and learn more about its concept, boosting new visits in the territory.

'PAIVA WALKWAYS' AND '516 AROUCA' – EQUIPMENTS FOR THE ENVIRONMENTAL EDUCATION IN THE AROUCA UNESCO GLOBAL GEOPARK (PORTUGAL)

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The environmental education is a fundamental instrument for the Sustainable Development, which has the power to contribute to the process of changing values, attitudes and behaviours of the society, in a context of non-formal education. Therefore, it is crucial in the capacitation of people and to leveraging public environmental policies. «Environmental Education Equipment» is defined by the Portuguese Environmental Agency as equipment with key characteristics: i) a physical space with adequate infrastructures and resources that allow to carry out environmental education activities, directed to different audiences; ii) an educational program (with one or more projects) that attend to the guidelines that characterize environmental education; iii) must, regularly, offer initiatives and activities throughout the year (more than 120 days/year).

In this context, the Paiva River, located in NE area of the Arouca UGGp (Portugal), is classified as a Special Area of Conservation (SACs) in the scope of Natura 2000 Network. An area with an important natural and cultural heritage where, in 2015, was inaugurated the 'Paiva Walkways', a wooden path along 8,75 km on the left bank of Paiva River, where are located five geosites of the Arouca UGGp and installed nine biospots (interpretative panels). In 2021 was also inaugurated the iconic '516 Arouca': a suspension bridge with 516 meters long, which crosses 175 m above the Paiva River bed. Both infrastructures are emblematic and play an important role in the environmental education activities of the Arouca UGGp. For the families and general public who visits, autonomously, both infrastructures, the guided tours in the bridge, the biospots, the QR codes of geosite flags, and the multiple publications are important resources for environmental education. The '516 Arouca' guides, and the local tourism enterprises guides have previous training on the values of the Arouca UGGp and Paiva River natural and cultural heritage and engineering aspects of the bridge, given by the Arouca UGGp staff. The Arouca UGGp's annual program of interpreted visits includes guided visits to both infrastructures. Furthermore, the school community can autonomously visit the infrastructures or take part of the 'Educational Programs of Arouca Geopark'. Five fieldtrips are available for small groups (maximum 30 people), all the school year, in the 'Paiva Walkways' and in the '516 Arouca', guided by the Arouca UGGp staff members, which explores the subjects of geology, biology, geography and/or tourism. Until today, the 'Paiva Walkways' already received more than 1,5 million visitors, the '516 Arouca' was visited for more than 240.000 visitors, and the specific educational programs mobilized 3035 students and teachers.

**“DIARY OF NATURE” – PROTECTION AND POPULARIZATION OF FREITA MOUNTAIN IN AROUCA
UNESCO GLOBAL GEOPARK (PORTUGAL)**

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The Freita Mountain is located in the south of Arouca UNESCO Global Geopark (Portugal), where they can be appreciated 13 of the 41 geosites of the territory, with highlight to the international relevance for the “Birthing Stones geosite” and the national relevance of “Mizarela waterfall geosite”. Schists, greywackes, and granite outcrops feature the landscape. In addition to the geological values of Freita Mountain, we can find in this area important habitats and species of fauna and flora, which justify the classification of this area in the scope of Natura 2000 Network as Special Area of Conservation (SACs) - “Serras da Freita and Arada” Site.

The valuable natural heritage of Freita Mountain, its protection and popularization were the motto to the creation of the educational project developed in scholar year 2020/2021, with the several constraints imposed by COVID-19 pandemic. This was an activity especially directed to art students from the Arouca Secondary School, a type of audience that is not always common to mobilize in activities related to Natural Sciences. In this project participated 142 students in the 3rd cycle of Basic Education and Secondary education grades, with whom were done sessions, developed by the geologist and biologist of Arouca Geopark Association (AGA). They were in charge of presenting to students the natural heritage of Serra da Freita, shared, for millennia, by locals. In turn, the students were challenged to illustrate the landscapes, geosites, fauna and flora elements, cultural aspects and even sports practiced in that region, using different drawing and painting techniques, during art classes, with the support of the teacher of this discipline.

The project resulted in illustrations in a perfect combination of ‘Art & Science’ through the eyes of the young people who live in the Arouca UGGp. The partnership between AGA, Arouca Secondary School and Arouca Municipality makes it possible to publish the best and most representative illustrations in a book, with 152 pages. This includes a storyboard constructed by AGA’s technicians based on a discovery route carried out by two young people who allow themselves to be enchanted by the heritage and peculiar characteristics of Freita Mountain. A way to reach an even wider audience and a challenge of registering and perpetuating memories and discoveries in the blank pages left, purposely, in the “Freita Mountain – Diary of Nature”. In addition, with the original illustrations, an itinerant exhibition was created, which was on display in Arouca at the European Geoparks Week 2023 and which is available for itinerancy to other geoparks in the Global Geoparks Network.

THE FORMATION OF THE PYRENEES AND THE LAST DINOSAURS OF EUROPE THROUGHOUT VIRTUAL REALITY EXPERIENCES IN THE ORÍGENSUGGP (VIGEOCULT)

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The UNESCO GlobalGeoparkOrígens, located in the Southern Pyrenees, is home to breathtaking landscapes, which hoard up a rich geological, paleontological, and cultural heritage. Its landscapes have the international recognition of the scientific community, which consider them a unique outdoor laboratory for the study and understanding of the geological structures and processes associated with the formation of the Pyrenees, and the reconstruction of the last dinosaur ecosystems in Europe. However, the geological processes that have shaped the Geoparktopography are often complex and difficult for the public to understand. The VIGEOCULT project – (PLEC2021-00793), funded by the Ministry of Science and Innovation MCIN/AEI/10.13039/501100011033 and by the European Union Next Generation EU/ PRTR – aims to create an open-door virtual museum that, through virtual and augmented reality (VR/AR) experiences, raises the dissemination of Earth sciences to another level.

The proposed open-air museum will include rock outcrop geosites, paleontological sites, and viewpoints where the observation of geological structures or landscapes with a rich geological heritage helps on the understanding of the intricate history of our planet. The first and essential step comprised a very detailed documentation of the sites. The selected sites require having a high scientific knowledge and that the subject treated in it contributes to the narrative of the natural museum experience. It is also valued that these sites include cultural heritage, which will enrich the experience of visitors. The sites are currently being digitally modelled to produce VR/AR experiences with cutting-edge technologies covering different geological periods.

In the field of paleontology, compiled data coupled with the digitization of the fossil record (e.g., dinosaur bones, ichnites, or nests), has allowed to virtually reconstruct the anatomic structure of several dinosaurs, to infer how they moved, and to recreate their paleoenvironmental setting. On the other hand, the rich scientific knowledge in the field of structural geology, sedimentology, and stratigraphy, combined with 3D geological reconstructions on a regional and local scale, has facilitated the reconstruction of the paleoenvironments of the past. This exceptional scientific background, treasured over decades of research, is key for the VIGEOCULT project to create an open natural museum in the Orígens Geopark territory throughout the use of new VR/AR methodologies on 3D geological reconstructions applied to the geological evolution of the history of the Earth recorded in the Pyrenees.

Thanks to the use and exploitation of these new technologies, the visitors will live a thrilling experience with a high didactic and emotional load. Based on the holistic awareness of conservation, science, education, and sustainable development, as marked by the United Nations 2030 Agenda and its Sustainable Development Goals, the VIGEOCULT project aims to create vital and fundamental virtual reality experiences that help to understand and become aware of nature greatness. Likewise, this new form of transmission of knowledge longs for visitors to the Geopark to fall in love with the territory, as well as our planet and its history.

,REVITALIZING GEOPARKS: A GAMIFIED ADVENTURE IN CULTURAL BUILDINGS

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Introduction: In the age of digitalisation, modern technologies have multiplied, changing how education works. This poster describes an Augmented Reality (AR) application for water related cultural buildings (watermill, local clothing washing mechanism, fountain), located within Sitia's (Crete, Greece) and Troodos (Cyprus) geoparks.

Methods: This study includes mini games developed using AR technology like puzzles, reconstruction and matching games. These activities aim to inspire users to explore cultural buildings and experience how they operated when they were active. For the digitalmodel'sdevelopment of the buildings two techniques were used: a) photogrammetry and b) a 3D computer graphics software tool (Blender). Through the activities, users can examine and view cultural buildings and attractions in real size.

Results: As a result, an educational application was developed that can familiarize users with the cultural heritage within thegeoparks. The provided activities offer a fascinating experience where the users can actively engage with the content by moving around and observing it from different angles.

Conclusion: This study showcased a gamified application to promote UNESCO'sgeoparks as a tourist attraction while educating its visitors about them. Special attention is given towards the element of the water and its multiple uses sincethis study was part of the "WaterWays" project.

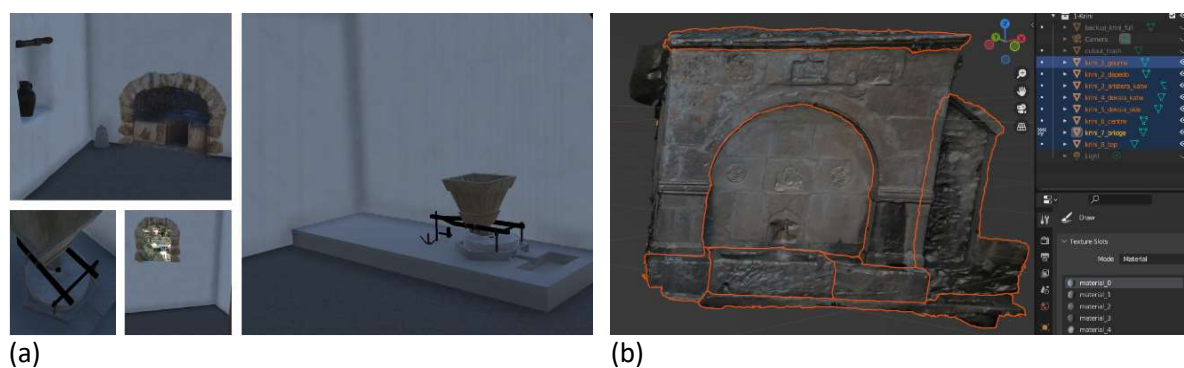


Figure 1. 3D representation of a water mill (a) and puzzle game of anOttoman Fountain(b)

TWO NEW TOOLS TO PROMOTE GEOSITES IN THE OESTE ASPIRING GEOPARK (PORTUGAL)

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The Oeste aspiring Geopark (OAG) is a territory that encompasses the municipalities of Bombarral, Cadaval, Caldas da Rainha, Lourinhã, Peniche, and Torres Vedras, and aims to become a UNESCO Global Geopark (UGGp). With 80 geosites identified, different strategies are being implemented to provide information about those sites, for both locals and visitors.

Due to two funding opportunities, OAG placed 20 interpretive panels on the littoral geosites of Lourinhã and Torres Vedras municipalities. These panels looking like a tilted table, are accessible for all kinds of publics, specially designed taking in consideration locomotion and sight disabilities. On its own, the interpretive panels/tables are already a good tool to provide local information to the public, permitting to understand the surrounding area. But specific strategies need to be implemented to tackle: 1. How people become aware of these tables' location; 2. How to avoid the accumulation of visitors on a few sites, by incentivising them to travel through the territory; and 3. How to provide more detailed information, if the visitor wants it, since the space on the table is limited and has to be appealing to different audiences. With these issues in mind, two different tools were created - a route leaflet and a webdocumentary.

One of the strategies implemented to promote geosites is through the creation of routes connecting them. Since these routes are thematic, they promote not just the site, but also the whole local heritage. The "E9 - European long distance path" crosses the littoral of the OAG's territory, and passes by/near our interpretive tables. With this in mind, we created a local route based on a section of this path, where visitors can travel on foot or by car. Called "Atlantic Route", people are invited to visit the sites with interpretive tables and to enjoy the surrounding landscape. A leaflet was created to promote this route, containing a brief explanation of our project, what aUGGp is, and a short description of the 20 geosites, in Portuguese and English. The GPS coordinates of the interpretive tables are also provided, to facilitate the visitors' travel, along the entire route.

Another important tool to promote geosites' visitation was the "Costa Encosta" webdocumentary (also called as interactive documentary, or multimedia documentary), which differs from traditional forms, through the implementation of multimedia tools. This webdocumentary is based on an online platform, where the viewer can interact with different contents, on its own time and on a sequence define by him. Using the same "Atlantic Route", the viewer can go through the different geosites where the interpretive tables are installed, taking a virtual tour through the territory. On each site, the visitor can interact with 360° videos of the chosen geosite, watch scientists' explanations and diagrams about different topics (Geology, Palaeontology, Geography, Archaeology, and local Culture) in a simple language, and 360° views of planet Earth through geological time. This platform is accessible at home, and on each geosite, because it adapts to mobile phone format.

INCLUSIVE INTERPRETIVE PANELS, INCLUDING VISUAL IMPAIRMENT INFORMATIONS, AT THE OESTE ASPIRING GEOPARK (PORTUGAL)

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The Oeste aspiring Geopark (OAG) comprises six Portuguese municipalities, encompassing an area of 1154 km² and 72 km of coastline. With 80 geosites, our mission is to provide easily accessible, simple, and concise information about the heritage of each site, to different audiences, in an inclusive way. In terms of content, the interpretive panels describe the most relevant information about the local Natural (Geology and Biology) and Cultural heritage. Several illustrative images, schemes and photographs are also present, representing elements mentioned in the text and aiding the explanation of geological processes. Descriptive texts were created to be concise and appealing to all ages. Further information can be accessed via a QR CODE, such as more detailed written information and other related images and videos.

The OAG designed its interpretive panels with a special care, in terms of materials and accessibility. The main structure is made with recycled and recyclable plastic, whereas the information is printed on an adhesive material, resistant to UV light, easily cleaned, durable and, in the future, removed and replaced. Our interpretive panels were conceived thinking in all kinds of visitors and specially in people with different disabilities. At the structural level, both the inclination and the height of the interpretive panels were designed taking in consideration the access and observation by people in wheelchairs, as well as by school children and families. The panels look like a broad table, 1.6 by 0.8 metres, with an angle of 15°.

A feature that stands out in these panels is a three-dimensional topographic model of the geosite and its surrounding areas, with indications of “where you are” and a few geographic reference points. Occupying about one third of the panel’s total area, this model helps visitors to look and understand the local landscape. This model is particularly useful for people who are blind or with visual impairment, since it makes it possible for them to have a tactile perception of the surrounding landscape. Also, the contrast ratio between the background and the front text is 7.23:1, specifically to be useful for people with visual impairment. Next to the QR CODE, there is a text in Braille inviting these citizens to access all the written information (both on the panel and on the OAG webpage) using an audio guide App (e.g. VirtualVison or VoiceOver) on their mobile phone. We believe that implementing such a project decisively contributes to a global and inclusive access to information and science, making the interpretive panels really inclusive.

The usefulness of these interpretive panels was tested by a group of people who are blind or with visual impairment, living at Lourinhã municipality, in the OAG territory. All the participants were able to have access to the relevant information and the feedback was very positive. Nevertheless, there were a few interesting suggestions to be implemented in the near future.

GEODOCS – A CULTURAL HERITAGE CONSERVATION AND EDUCATIONAL INSTRUMENT IN THE OESTE ASPIRING GEOPARK (PORTUGAL)

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The Oeste aspiring Geopark (OAG) has a rich tangible and intangible cultural heritage, very vivid in the hearts and activities of the local population. This territory embraces the municipalities of Bombarral, Cadaval, Caldas da Rainha, Lourinhã, Peniche, and Torres Vedras, totalizing 1154 km². Mostly composed of rural areas, it's millennial agricultural activity supplies the country's capital, Lisbon, <100 km to the South. Other distinctive ancient traditions are associated with fishery, with one of the major national fishing ports located in the OAG.

In 2021, the OAG produced a long documentary, and five short ones, portraying the people and the main traditions of its territory. The objective of producing such documentaries was to promote the cultural diversity of this aspiring Geopark, but also to serve as a mean to preserve its cultural identity, since several traditions may be lost in the near Future. The five main cultural topics approached were: I) Agriculture; II) Confectionery; III) Wine and Vineyard; IV) Fishery; V) and Intangible Heritage (with ceramics, embroidering, cutlery, and the Good Kings singing traditions).

The large documentary has a length of 1h25, detailing all five mentioned thematics. On the other hand, the shorter documentaries are around 15 min long, each one dedicated to a single theme. These "short docs" were produced using the same footage as for the long documentary, but they were created by a different team, resulting on mini-docs that are quite different from the long one. This implies that seeing the large documentary doesn't exclude the need to see the mini ones.

Illustrating the cultural heritage diversity of this territory in smaller documentaries is a lighter way to contact with the diversity of this heritage, on the viewer's free time. All documentaries were made available on the OAG's Youtube page <http://www.youtube.com/@aspiringGeoparqueOeste>, free of charge, with English subtitles.

School teachers from the territory and outside have been using these documentaries in classes, to provide information on the local cultural heritage, in a more appealing way. The viewing of these documentaries has triggered the student's interest and led to the development of other related projects. As an example, a school class was so enthusiastic that they decided to make interviews with two of the people portrayed in one of the short documentaries. Through these interviews, they had first-hand contact with local traditions, learning and valuing their heritage. These interviews were filmed and resulted in two small videos that were produced by the students, and are also available on our Youtube page. This interaction between the students and the local activities also led to the creation of a small school exhibit, advertising to the entire school community what the students had learned about local heritage, creating awareness of the cultural legacies of the OAG's territory .

RECONCILING TOURIST PRESSURE AND SUSTAINABLE TOURISM IN THE FAMENNE-ARDENNE GEOPARK: REALITIES, TOOLS AND CHALLENGES.

Petit Alain, Famenne-Ardenne UGGp (Belgium)

The Famenne-Ardenne Geopark (Belgium) has historically been a very popular tourist destination, with major potential. The Domaine des Grottes de Han, for example, welcomes 300,000 visitors a year to its caves and animal park. Durbuy, one of the Geopark's key destinations, is also attracting large numbers of visitors, who need to be kept under control. The area is also experiencing significant growth in the number of properties being rented or sold for tourism purposes.

Finding a harmonious balance between protection, preserving the soul of the area and developing tourism is a real challenge, and requires management and regulation strategies. Implementing these strategies requires, for example, knowledge and measurement of the number of visitors to these areas. Among other things, measuring tourist flows within the various open spaces often remains a problem, as does the extent of 'unofficial' accommodation, the importance of which is little known.

Counting techniques, such as various instruments for monitoring, collecting and analysing data, could enable progress to be made in this area. These systems for measuring and observing tourist numbers are often used to help stakeholders determine the carrying capacity of areas, particularly with a view to avoiding the many risks associated with (over)frequentation by tourists.

Defining a maximum threshold for tourist numbers and occupation of an area is therefore at the heart of the concerns of those involved in tourism and nature. Exceeding this threshold can have irreversible environmental effects and lead to a loss of identity, while there is also a risk of altering the quality of the visitor experience and visitor satisfaction. The issue is all the more important given the significant increase in the number of tourists visiting natural areas in recent years.

However, calculating the maximum number of visitors that should not be exceeded is proving to be a particularly arduous exercise. The major difficulty arises from the ambition to consider simultaneously, on the one hand, physical and ecological parameters and, on the other, economic, socio-cultural and psychological parameters relating to tourist numbers and the expectations of the many local stakeholders.

Implementing a sustainable development policy can provide a response that aims to reconcile an area and tourism.

AN INTERPRETATION CENTRE FOR THE OESTE ASPIRING GEOPARK (PORTUGAL) – CONCEPT AND CONTENTS

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The Oeste aspiring Geopark (OAG) is located in Central West Portugal, 50 km N of Lisbon, encompassing the municipalities of Bombarral, Cadaval, Caldas da Rainha, Lourinhã, Peniche, and Torres Vedras. This territory aims to become a UNESCO Global Geopark (UGGp) and the formal application was submitted in 2022. Its geological internationally relevant highlights are the presence of the Toarcian GSSP (“Golden Spike”) and an abundant and unique fossil record, particularly of Late Jurassic dinosaurs (with a dozen holotypes) and Cretaceous angiosperms. To welcome and to inform the visitors about the Geopark, an Interpretation Centre was implemented at the locality of Bombarral, strategically centred in the territory and easily accessible from all the other municipalities (around 30 min by car), just aside the main regional highway A8.

The Interpretation Center (CIGO - Centro de Interpretação do GeoparqueOeste) uses the facilities of an inactive Primary school, built in the 1980’s, with large entrances, different sized rooms and excellent natural light. The main objective of CIGO is to introduce all the visitors, before they depart to explore the territory with a guide or by themselves, to i) the “UGGp concept” and the Portuguese Geoparks; ii) the geological evolution of the planet and of the OAG’s territory; and iii) the different values and highlights of the OAG. The overall structure and contents of CIGO are as follows:

A) Front courtyard – with 1800 m², it is being transformed into a new green area, with autochthonous living trees, environmentally transforming this space; a green path will be created, displaying some regionally relevant heritage items, such as a dinosaur, a small fishing boat, a human-sized pear or a large ceramic sculpture.

B) Entrance and inside courtyard – with 200 m², this area displays several panels with information, maps and photos about: i) the UGGp concept; ii) the Portuguese UGGp; iii) the Portuguese aspiring UGGp; and iv) the OAG territory. This courtyard has a central open-air space, to be used as a living “Mesozoic Garden”.

C) Mesozoic room – the outer wall displays a 14 m long geological time-line showing the different Eras and Periods, with the main geological and biological events, from the Pre-Cambrian to the Quaternary; this room will be used for video projections and presentations for visitors, with an exhibition about the geological evolution of the territory within the framework of the N Atlantic opening and alpine collision; large photos and information about the main geosites, as well as attractive rock samples and fossils, will illustrate it.

D) Thematic rooms – three rooms, with around 50 m² each, will cover different components of the Geopark’s scope, namely: i) Biodiversity and Protected Areas; ii) Culture and Tradition; iii) Climate Change; and iv) representation of other UNESCO seals in the territory.

A comprehensive circuit will take all visitors (childrens and adults) along these different spaces, ending in front of a large mirror reflecting the visitors own image, with the sentence “Here is the future of humankind”.

TRAINING LOCAL GEOGUIDES TO IMPROVE SUSTAINABLE TOURISM AT THE OESTE ASPIRING GEO PARK (PORTUGAL)

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The Oeste aspiring Geopark (OAG) is located in West-Central Portugal and comprises six Portuguese municipalities, encompassing an area of 1154 km² with 72 km of coastline. The main geological highlights are related to the presence of abundant and important dinosaur remains (bones, footprints and egg nests) and the definition of a GSSP (Global Boundary Stratotype Section and Point) for the Toarcian. Besides these two “flags”, the territory shows a unique geological record of the North Atlantic opening, interesting salt tectonic landscape features and diapir related thermal waters, as well as a dynamic coastal area with sand beaches and lagoons. All these aspects make this region an attractive area for nature activities such as trekking, biking, hiking or even surfing, therefore promoting sustainable tourism.

However, the simple existence of these features is not, on itself, a condition to attract visitors wanting to explore the territory on all its natural values. Therefore, the OAG launched a certified training program for local guides (GEOGUIAS) with specific rules and conditions: A) REQUESTS – to be someone promoting touristic activities within the territory; to have specific training by the OAG; to promote geosites and all the natural and cultural heritage of the OAG; to follow the Good Practices Code of the OAG; B) DUTIES – to have knowledge about the natural and cultural heritage of the OAG; to promote geosites and biodiversity conservation; to suggest any improvements related to the OAG’s outdoor activities; C) CERTIFICATION – annual courses promoted by the OAG for local guides; courses with both class and outdoor (at least 50%) components; certification based on attendance and an individual final report; Geoguide diploma valid for 5 years.

Two courses took place until now, with a total of 46 certified Geoguides. In 2023, this course was included in the “Digital Academy” training programs of the National Tourism office and organized in collaboration with the EHTO (School of Tourism and Hotel Management of the West) and a local partner (Intertidal). The structure of the course includes eight Modules, with a total of 50 hours: M1 – Personal attendance and communication; M2 – Code of Good Practices of the OAG; M3 – Touristic programs catalogue of the OAG; M4 – Natural and Cultural heritage of the OAG; M5 – Management of walking trails; M6 – Logistics and safety for field activities; M7 – Field Course (4 full days); M8 – Development of a personal Touristic Program (Final Report).

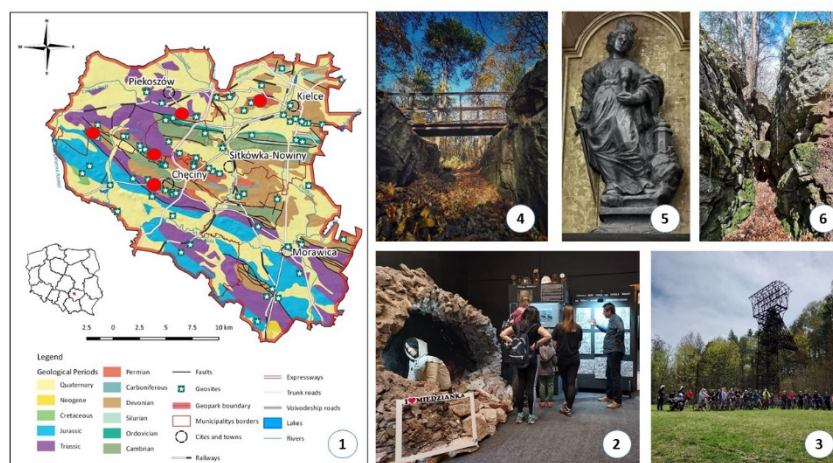
We believe that this specific training of local Geoguides is a very effective strategy to promote sustainable tourism at the OAG and, simultaneously to promote the geopark concept itself. The feedback is highly positive and encourages us to pursue this specific training and to involve more individual geoguides and small local touristic partners to promote the territory and the OAG.

INTERPRETATION OF MINING HERITAGE FOR THE PUBLIC ON THE EXAMPLE OF SELECTED GEOSITES IN HOLY CROSS MOUNTAINS UGGP (POLAND)

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The mining heritage is an important element characterizing the area the Holy Cross Mts. UGGp. The area of the geopark is characterized by a large accumulation of the remains of ore mining associated with the extraction of lead, silver and copper ores since the Middle Ages (Fig. 1). Until now, many of these remains have been very poorly preserved, which significantly hinders proper reading and interpretation by visitors. Therefore, in the area of Holy Cross Mts. UGGp has taken a number of actions aimed at protection, conservation and access, along with the interpretation of historical ore mining sites. One of several examples of good practice is the creation of the Ore Mining Museum Chamber at the Miedzianka nature reserve (Fig. 2). This facility, combined with an educational path, aims to make available and interpret for the public one of the most important sites in Poland related to the historical mining of copper ores. An important aspect of the activity of the Museum Chamber is also the interpretation of the origin of copper deposits, the interpretation of various periods and mining techniques, and the presentation of the history of copper mine operations over several hundred years (Fig. 2, 3). An important part of the mining heritage of Holy Cross Mts. Geopark is a historic mining of lead and silver ores. Typical remains of this type of mining are mining fields with preserved mining cracks, shaft sinkholes and heaps. Classic sites with the highest concentration of this type of remains are protected within the nature reserves: Karczówka (Fig. 4, 5), Moczydło (Fig. 6), Żakowa and Rzepka. They are also one of the most valuable geosites in the geopark. Two of these geosites are interpreted in the field in the form of geotouristic paths supplemented with interpretation panels. The problem with the proper interpretation of this type of remains in the field is related to their usually poor state of preservation and a relatively small amount of archival materials (especially illustrations) that document the appearance of the lead and silver mines from the times of their operation. There are currently two geological-mining paths in the geopark, which focus on the interpretation of traces of former ore mining: Karczówka-Dalnia-Grabina (Fig. 4) and Moczydło (Fig. 6). In the case of the first of the mentioned paths, cooperation with the local community that owns the land on which the most interesting remains of technical objects related to the lead ore mine are located is of great importance. In this case, the cooperation of the geopark with the local community is aimed not only at preserving and regular maintenance of mining traces, but also at disseminating knowledge about historical mining and the enormous value of this heritage for present and future generations.



**SMALL VILLAGE ACTIVATION TO IMPROVE SUSTAINABLE PRACTICES AND COMMUNITY WELL-BEING:
A CASE STUDY OF TANJUNGBUNGA VILLAGE IN TOBA CALDERA UNESCO GLOBAL GEOPARK**

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Toba Caldera UNESCO Global Geopark is a caldera formed as the result of a volcanic massive explosive volcanic eruption. The geopark is distributed in 7 regencies of North Sumatera Province, whose area is undulated hills (43%), mountains (30%), and plains (27%). Samosir regency is the center of Toba Caldera and one of the most active Caldera Resurgent in the world. It has a high risk of tectonic earthquake-prone, subsidence, and flooding. In addition, there are also significant areas in Samosir regency that have become critical lands as the result of deforestation, which will affect Toba Lake's water debit as the source of livelihood, food, and energy. This situation is a disadvantage to geopark's value which aims to conserve and protect the area's geological, forest, biological, and cultural heritage, therefore activating small villages in geopark to conservation while at the same time improving community's well-being is a must. TanjungBunga village is one of the small villages in Pangururan district of Samosir regency, which is becoming one of the targeted places for reforestation. It is located between the shore of Lake Toba and towards the hill on the way to PusukBuhit, the plateau known as the first Batak people exist in Lake Toba, and an ancient trail for improving the magical power. While the upper land is dry and low access to water, the awareness and commitment of local people to be involved in conservation and reforestation program are low, as well as the people's well-being. There were a number of tree planting program failed as the trees were abandoned and the people found the program as a threat for taking their lands. As the problem becomes urgent, a four-year program to activate the village on conservation and welfare improvement was carried out for the period of 2019-2022.

Soft system methodology (SSM) is used to find the best model and strategy to activate TanjungBunga village to participate in reforestation and sustainability practices, while improving local people's welfare. It is an organized way of thinking to tackle general problematic situations that arise in TanjungBunga village and the change management by using actions through seven stage model from problem definition to action to improve the problem situation.

In the first year, we made a site survey to identify the economic, social, and environmental potentials and risks. We also conducted interviews and focus group discussions with local people to get their aspirations and identify that they are willing to participating in conservation by embedding it with welfare improvement. Sustainable tourism development and creative home industry are the activities sought. After that, we propose an empowerment model that suits their aspirations, as well as tourism development and empowerment road map. In the second year, we support the villagers with sustainable business ecosystem based on the model and encourage local people to participate in the business ecosystem and create a digital platform to get and share information, integrate each business, and develop possible tourism trails. Socialization training in conservation and sustainable practices, and how to become a good host as well as basic tourism services were also carried out. At this point, we see that there was a need to improve people's awareness and commitment to conservation and sustainable practice as people tends to get instant result, and skepticism in the program as their fear that the program is authorities' tool to take over their lands, therefore a conservation awareness became the third year's program. We conducted conservation awareness for small students by working together with local public school and teachers through conservation board games that can be played by students with teachers, conservation books, and socialization. For adults, we socialized adopting a tree planting for visitors and tourists embedded in the tourism package, producing local snacks and souvenirs as well as packaging to make planting trees become a movement that can be promoted to tourists and consumers. In the fourth year, we formalized and institutionalized the program into the formation of BUMDes (village-owned enterprise) which sections cater conservation movement, tourism, and creative businesses.

Despite the long program, the result of the program is not as satisfactory as our initial expectation, as COVID-19 pandemic hits and delayed any development in tourism and creative sectors. There are also cultural problems as local people lack commitment and seek instant results, however at least people have been intervened with programs, strategic planning, branding and a step by step know-how on conservation and monetize it to the economic and social activities of the villages.

THE SUCCESSFUL RESULTS OF FULLY COOPERATION BETWEEN PHUWIANG NATIONAL PARK AND KHONKAEN ASPIRING UNESCO GLOBAL GEOPARK

Phakasawan Pratchayakup, Sutham Wongchun

KhonKaen Aspiring UNESCO Global Geopark / Phu Wiang National Park , Thailand.

KhonKaen (a)UGGP is located on the northeastern of Thailand, known as the valley of dinosaur kingdom. The boundary covers an area of Phu Wiang National Park, Wiang Kao District, and Phu Wiang District, with an area of 1,038 sq. km. The Phu Wiang National Park itself spans 325 square kilometers, which accounts for 31.3% of the entire area of the geopark. This national park is one of the most important forests in the upper northeastern region of Thailand. It serves as a significant location for numerous geological excavations, particularly the nine excavation sites. The national park also features caves, waterfalls, cliffs, and prehistoric paintings.

The missions of national parks in Thailand are to conserve, protect, and restore forest and wildlife resources, conduct research, promote sustainable and balanced utilization of natural resources. Prior to 2018, Phu Wiang National Park itself faced limitations in its operations due to insufficient staff and budget. Additionally, there were numerous challenges, such as lack of understanding among the communities surrounding the park, illegal logging and poaching, forest fires, constraints in conservation efforts, geological excavation and research, and community involvement.

At the beginning of 2018, Khon Kaen Geopark was established, and the team began discussing the work of the geopark, which shared the same goals as Phu Wiang National Park. The focus was on holistic management and administration to improve the efficiency of operations. Consequently, an MOU was signed to drive the geopark forward in collaboration with the national park and relevant stakeholders. By the end of 2018, Phu Wiang National Park became the strongest ally in the operations of Khon Kaen Geopark. The geopark played a vital supporting role in problem-solving and the development of, particularly in terms of coordination, consultation, support for personnel, machinery, and various activities for the national park. Currently, Phu Wiang National Park is recognized as one of the most progressive national parks in Thailand, with visitor numbers increasing by up to 13 times and receiving a Green National Park Award at the golden (highest) level.

The Phu Wiang National Park and Khon Kaen Geopark have achieved numerous successful projects together. These include implementing the Smart Patrol system for surveillance, developing tourism destinations, organizing tourism activities for people with disabilities, improving water sources, creating nature study trails, enhancing signage systems, fostering community conservation awareness through spiritual beliefs, establishing a ranger memorial, promoting astro-tourism, conducting youth camps, afforestation efforts, organizing photography competitions for tourism promotion, postcards for forest rangers, and supporting forest fire suppression. These endeavors demonstrate successful collaboration between Khon Kaen Geopark and Phu Wiang National Park, showcasing the achievements of a network and holistic approach following Global Geopark management.

FORMER QUARTZ SAND MINES AS A GEOTOURISTIC POTENTIAL OF THE VIS ARHIPELAGO GEOPARK

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The quartz sands on the island of Vis were mined by the island's miners from 1738 up until the middle of 20th century. Most of the quartz sand was being shipped to the Murano glass factories in Venice. Demanding tasks of digging and extraction of the sand were done by using very simple tools in a harsh environment lit up only by the flickering lights of torches and candles. Quartz sand was also extracted by the local population for their personal needs, mostly for dishwashing [2]. Quartz sediments form a part of a continuous sequence of Cretaceous deposits. A part of quartz was formed by direct precipitation, but the majority is a product of silicification of carbonate sediments [4]. There are three quartz sediment layers among the geological layers of the island of Vis [3]. Older, i.e. lower layer appears in limestones of the upper part of the Albian-Cenomanian and it is not of economic importance. The second or the main layer is dated as the lowest part of the Cenomanian, 30 meters above the first layer. The quartz sand layer in this part is 1-6 meters thick, chemically pure, white, and of great economic interest for glass industry. Third or the upper layer was discovered about 20 meters above the main layer and is about 1 meter thick [3, 4]. Most of the mines are a combination of natural and artificial features [1] since the process of karstification created much bigger underground cavities which miners came upon while mining the quartz sand. Various cave decorations such as stalactites, stalagmites, stalagnates, flowstones, and many others occurred in those cavities long before the mining activities started [2]. Some mines are winter habitat of bat colonies and other endemic fauna [1]. A total of 29 mines have been discovered up until now. Topographic maps and sketches, the exact topographic positions of the entrances and photos of underground spaces and cave fauna were provided for all of the mines. They represent a part of the cultural-historical heritage of the Vis island [2] and could be used in the future as tourist sites - cave parks [1].

EDUCATION WITH SIMPLIFICATION OF SCIENTIFIC KNOWLEDGE ACCESSIBLE TO THE GENERAL PUBLIC

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European Funding Projects are a way to create educational applications and tools for our Geopark. In 2011, we used our first EU PROJECT with the acronym “Geotopia” to renovate, furnish and equip our visitor center in Amiantos. Since then, the use of EU funding projects has been an important tool for Troodos UNESCO Global Geopark. With this tool we can develop new educational tools, games, materials, books, videos, animation educational videos for children, applications, new nature trails, alternative tourism buildings, educational guides, maps, etc. From 2011 until today, more than 10 EU PROJECTS (Interreg Greece/Cyprus, Interreg Mediterranean, Horizon, LIFE and Leader) have contributed and are still contributing to the enrichment of our Geopark in general and the Visitor Centre.

In addition to the applications and tools, we are able to collaborate with other geoparks (mainly Greek geoparks), which creates new ideas, partnerships, a sense of brotherhood and community building. In this presentation we will share the projects, the educational tools and applications that have been created, the challenges and the collaboration between geoparks.

OPEN ECOMUSEUM OF SITEIA, CRETE, GREECE: ACTIONS AND DELIVERABLES OF THE “ECO.MUSE” PROJECT, INTERREG V-A “GREECE-CYPRUS 2014-2020”

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Ecomuseum is an open museum of culture, nature and history, without walls, it spreads over a delimited territorial area, containing intangible and material elements of local heritage. It functions as a communication space, with the objects telling their story as 'living' parts of the place, revealing their relationships with people and the landscape. Within the framework of the European Territorial Cooperation Programme Interreg V-A “Greece-Cyprus 2014-2020”, a project is being implemented since June 2021 on a “Network of Open Eco-Museums for the Promotion and Mild Enhancement of Areas with Environmental History” (Acronym: “Eco.Muse”). The project is co-financed by the European Union (European Regional Development Fund-ERDF) and by National Resources of Greece and Cyprus. The “Eco.Muse” project provides the creation, operation, management and networking of three (3) new Ecomuseums in the areas of Siteia and Agios Nikolaos, Regional Unit of Lassithi, Crete, Greece, and in the area of Marathasa, Limassol District, Cyprus. The main objectives of the creation and operation of the 3 Open Ecomuseums are the development of the regions with the active participation of the local community, the strengthening of areas with rich natural and cultural heritage, and the highlighting and protecting the natural and built environment, with the aim of their rational and sustainable development through the active participation of local social and professional bodies. The UNESCO Geoparks of Greece and Cyprus, in Troodos (Cyprus) and Siteia (Greece) are the main resources for the Ecomuseums, as geosites and as natural and cultural heritage, and are the cornerstone and basis for the networking of the Open Ecomuseums of “Eco.Muse” project.

For the Ecomuseum of Siteia the following actions are under implementation:

- (1) Creation of a Model Olive Education Center by the renovation-configuration of the former Agricultural Education Center in Siteia;
- (2) Promotion of the Maronia’s Oil Factory;
- (3) Museological study of connecting Ecomuseum buildings with the countryside – Proposals for connection routes;
- (4) Plan for the Integration of Activities and Actions into the operation of the Ecomuseum;
- (5) Organization and operation of the Ecomuseum Management Agency with open participation of agencies/citizens;
- (6) Production of an interactive route map, as well as printed and electronic information material;
- (7) Organization of two consultation workshops with stakeholders of the area of Siteia;
- (8) Training of specific groups of people concerning the presentation-projection-interpretation of the natural and cultural environment of the Municipality of Siteia (e.g. tour guides, tourism professionals, owners of alternative tourism enterprises, etc.);
- (9) Creation of a Support Network of the Open Ecomuseum of Siteia by bodies/services of the Municipality of Siteia.

CIRCULAR TOURISM AND GEOPARKS. THE CASE OF “GREVENA - KOZANIUGGP” (GREECE)

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The term “Circular tourism” defines an economic system able to support the development of touristic destinations without putting in danger the sustainability of the area. It is based on the principles of “circular economy” having as goal economy’s regeneration by minimizing the use of resources and avoiding their waste. Thus, as circular economy aims to create a circle of products and services without further elimination of planet’s resources (raw materials, water, energy), circular tourism promotes a model where all the engaged stakeholders (local producers & suppliers, tourist agents, DMOs, hosts, tourists) adapt an environmentally friendly approach through circular routes, matching the tourist sector with sustainability and carrying capacity. Circularity doesn’t refer only to product producers and service providers but also to tourists themselves, who decide how they travel and spend time in destinations, how they use infrastructures, how they behave in “circular way”. Circular tourism is not only a version of “green tourism” aiming in recycling and reuse, but also incorporates conservation and exploitation along with regeneration and rebirth. As a consequence, cultural & natural heritage and geoheritage of Geoparks also matter, in the framework of an integrated approach.

A relevant case study is the Project ECOTOURS - “Empowering local communities turning them into laboratories for co-development of circular and sustainable tourism ecosystems” (SMP-COSME-2021-TOURSME), funded by the European Union and being implemented in 6 European Countries (Greece, Italy, Spain, France, Cyprus, Hungary) by 7 partners. Project’s Activity 4 – “Support to the creation of a circular ecotourism itinerary” has as scope to create six digital itineraries promoting circular tourism, one in each partner country, using interactive maps. Through an open call, the SMEs that will be selected will co-create the route in their country within an individual plan that will be developed in order to present which stakeholders are to be involved and how they will be engaged. Also, consultancy and coaching for circular business development, sustainability consultancy & certification and transnational study visits along with an innovation contest will take place.

The circular routes of the Project in the Region of W. Macedonia in NW Greece will be searched into “Grevena - KozaniUGGp” that is located in an area of 2,500 km² with 25,000 inhabitants. The Geopark comprises a foundation site of Plate Tectonic theory with a billion years of geoheritage including Pangean rifting, collision and destruction of Tethyan Plate and a geoenvironmental evolution birth of 2 biodiversity hot spots. In Geopark’s reach geological and environmental reserve 5 Geo-tourism Thematic areas are identified in which 8 Geo-trails run through 78 Geo-sites providing a dynamic background for the development of “Circular Geo-tourism”.

TOOLS FOR THE MANAGEMENT AND PLANNING OF THE LANDSCAPE AND AGRICULTURAL SPACES OF THE ORÍGENSGEOPARK

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The climate emergency we are facing needs to be addressed as soon as possible. The response given to this issue has been a significant and rapid increase in the generation of energy from renewable sources. This situation has triggered rural areas, such as the Orígens UNESCO Global Geopark, that have received many applications for the implementation of macro-projects of renewable energies in its territory. Specifically, the solar farms proposed cover an area of 600 ha concentrated in an east-west strip of the central part of the Geopark.

The lack of planning regulating this type of activity in rural areas makes these projects potentially put at risk our valuable territories and their sustainable local development due to the denaturalization of landscapes and their impact on the natural and cultural heritage. In addition, they influence and promote the loss of identity and the devaluation of our territories.

The Orígens UGGp is located in the northeast of Spain, in the province of Lleida in Catalonia, 200 km northwest from Barcelona, and it is made up of 19 municipalities with 16,405 inhabitants. Its territory has a population density of 8 inhabitants/km². However, 13 of the 19 municipalities have less than 5 inhabitants/km². The demographic development over the last 50 years has been characterized by a decreasing population.

The Geopark, at the request of its general assembly members, commissioned a study to develop and propose a series of guidelines for the preservation of the landscape and agricultural spaces. This study establishes the criteria for evaluating new projects and, in this way, regulates the changes and potential impacts, with the objective to prevent negative effects that may compromise the territory's sustainable development. The study characterized the Geopark territory according to landscapes to be protected and managed and identified highly anthropized or degraded areas as priority areas for the development of new activities with high landscape impact. Two criteria were established for areas to be protected, while 35 criteria focused on the regulation of areas to be managed.

This study was approved by the Geopark general assembly in 2022 and is the basis of local planning since the municipalities of the territory incorporate it into their planning regulations. In addition, to help with the implementation of these criteria, the Geopark created an online viewer directed to municipality and County Council staff, so they have at hand all the necessary layers of information and elements to evaluate objectively new development projects or building permits that are requested in their demarcation. This online viewer includes: digital maps of the Geopark inventories; thematic maps resulting from the study of landscape protection, management, and planning; regional planning datasets; areas characterized as natural protected spaces; landscape characterization units; a map of threatened habitats; urban planning and land registry datasets; and the reference topographic and orthophotography maps.

**GEPARK, SUSTAINABLE TOURISM AND WOMEN EMPOWERMENT
IN MAROS PANGKEP UNESCO GLOBAL GEPARK**

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Women in the Maros Pangkep area have the opportunity to develop their own potential which is supported by the abundance of raw materials around the geosite. Geopark is an area that has a unique and interesting geological heritage. Geoparks provide very significant geological features and there are many diverse ecosystems. Geopark provides training and education for women around geosites who are able to contribute to sustainable tourism.

This study aims to find out how geopark and sustainable tourism for the empowerment of women in Maros Pangkep UNESCO Global Geopark. The empowerment of women in geoparks is carried out in order to create better sustainable tourism. Maros Pangkep Geopark has provided opportunities for women in the Maros Pangkep area to improve their skills in terms of assisting the development and management of geosites, where this has an impact on preservation for sustainable tourism and provides benefits for residents around the geosite and more benefits for tourists.

This research contributes to the social sciences as well as contributes indirectly to society. The benefits of this research can be useful not only for the geopark but also in terms of developing resources to increase sustainable tourism in the Maros Pangkep UNESCO Global Geopark

A NEW APPROACH TO APPLYING GEOTOURISM INTERPRETATION

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Interpretation plays a crucial role in effectively conveying geotourism data to geotourists. Specifically, poor interpretation hinders public comprehension and conservation of geology, ecosystems and cultural heritage. Hence, there is an urgent need consistent and reliable interpretations. This paper employs a corpus-based method to examine Li et al., (2022)'s proposed taxonomy of interpretation strategies and SSC (semantic, style and cultural equivalence) quality assessment model for Chinese-to-English data interpretation. Both the model and the taxonomy are built on a framework of Hu's Eco-translatology (2003). Since geoparks are the prime destinations for geotourism activities, three Chinese UNESCO Global Geoparks, namely Fangshan, Xiangxi, and Mount Kunlun, were selected as case studies.

As part of the rigorous method, to annotate the geotourism data and improve corpus analysis, Tmxmall (2014) and Sketch Engine (2003) software were utilised. After quantitative and qualitative analysis, the research findings indicate that a majority of the Chinese-to-English interpretation strategies proposed by Li et al. (2022) for the data were successfully used in all the categories of geotourism, Abiotic, Biotic and Cultural elements. This result was confirmed by the SSC model. Therefore, both the model and taxonomy can be highly recommended to translators and interpreters and for future studies in geotourism interpretation.

INHERITANCE AND UTILIZATION OF THE INTANGIBLE CULTURAL HERITAGE IN THE XIANGXI UNESCO GLOBAL GEOPARK

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The Xiangxi UNESCO Global Geopark is located in Xiangxi Tujia and Miao Autonomous Prefecture in Hunan Province, China, covering a total area of 2,710km². The geopark lies on the marginal slope in the east of Yunnan-Guizhou Karst Plateau. It is noted for the two GSSPs in the Cambrian system—the GSSP for Guzhangian Stage and the GSSP for Paibian Stage. The geopark also features some geosites, including the world's largest red carbonate rock Stone Forest and spectacular plateau incised platform-canyon group. The geopark's traditional ethnic minority culture perfectly combines with the natural ecology of platform-canyon to form a beautiful and harmonious living environment.

The geopark features humid climate, deeply-incised canyons and difficult access. Over the past years, various ethnic groups have formed different styles and types of ethnic cultures. The ethnic minorities' villages, as the best carrier of ethnic minority's culture in the geopark, are fully shown to the public through intangible folk customs (i.e. rites, traditional holidays, religion, music and dance). The geopark is famous for its folk customs that have been passed down from generation to generation, diverse ethnic arts, unique ethnic clothing and food, myths and legends, witch culture and traditional opera, fishing and hunting culture, festive culture, costume culture, and food culture, etc. These cultures are closely associated with the local complex geological structure, intermixing of gorges and cliffs, humid and rainy climate, as well as the favourable karst ecological conditions.

Nowadays, 25 traditions have been listed under the National list of Intangible Cultural Heritage of China in the geopark, e.g. dancing, singing, cuisine etc. The Autumn Harvest Festival of the Miao ethnic group was also inscribed on UNESCO's List of Intangible Cultural Heritage. The geopark managers focused on the inheritance and utilization of the intangible cultural heritage in the local community, they hold training classes for the home-stayed people, who can learn a skill from the classes, on the intangible cultural heritage projects and contact with more tourism-related companies, providing jobs for those people. Consequently, the intangible cultural heritage in the Xiangxi UNESCO Global Geopark has been inherited and utilized in a sustainable way.

ESTABLISHMENT OF WUGONGSHAN ASPIRING UNESCO GLOBAL GEOPARK AND LOCAL SUSTAINABLE DEVELOPMENT

Chen Qiong, Ren Fang

Wugongshan Geopark is located in the northwest of Jiangxi Province, China, it has virtue of geological and geomorphic landscapes such as the low-latitude granite alpine meadow, granite peak forests, Z shaped waterfall groups and the ring-shaped "hot springs chain" under the control of a dome structure. In recent years, Wugongshan Geopark has developed tourism industry, promoted social and economic development, lifted local people out of poverty, by guiding residents to participate in the construction and operation of inns, hotels and farmhouses, residents' income has gradually increased, it not only has created many job opportunities for local people, but also closely involved in the Geopark management, some have become the Geopark stakeholders. At the same time, it has carried out service facilities construction, strengthened geological heritage protection and popular science publicity, Achieve sustainable development. In 2022, it has become one of the candidate sites of UNESCO Global Geoparks.

THE RESILIENCE AND MITIGATION OF THE TERRITORY OF THE OESTE ASPIRING GEOPARK IN COMBATING CLIMATE CHANGE

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The territory of the Oeste aspiring Geopark has 1154 km², of which 72 km are Atlantic coast. About 35% of its coastline is composed of dune ecosystems that have the mission of protecting the agricultural fields from the progressive advances of the sea. On the other hand, in the remaining 65%, we find rocky cliffs which lose ground to the sea every year, reducing beach areas and often blocking pedestrian and motorized roads. In this sense, the municipalities that integrate the Oeste aspiring Geopark have jointly developed a set of mitigation and resilience actions to phenomena caused by climate change. That includes the development of Municipal Plans for Adaptation to Climate Change, which in turn integrate the Intermunicipal Climate Change Adaptation Plan. These plans contain a set of actions to be implemented in an integrated manner in the territories and which include: the consolidation of cliffs with the construction of small protection bars and small ports; dune naturalization; construction of elevated walkways in dune zones; permanent or sporadic conditioning of access near the coastline; implementation of awareness-raising strategies for local communities; implementation of protected areas in coastal zones; installation of equipment to facilitate access to bathing areas; reduction of urban pressure in critical areas, such as flood zones or the coastline.

The progressive implementation of these measures is recognized by local communities, but especially by national and foreign entities. Examples of such recognition are the "Green Destination" awards assigned to the Region; "Green Key" for the hospitality; and the "Blue Flag," "Golden Award," "Accessible Beach" for the excellency of the beaches.

Thus, the Oeste aspiring Geopark stands out as a territory that, despite the risks associated with climate change, namely at the level of permanent pressure on its coast, has developed a set of local and regional strategies in an integrated way with the different public and private entities. The main objectives are: to implement actions that contribute to minimizing the impact of climate change; to contribute to the settlement of resident populations and land use planning; and to a substantial increase in visitors, namely those who seek quality tourism that is concerned with the sustainability of ecosystems, in a resilient way and committed to future generations.

ECONOMIC BENEFIT IN THE CIRCULARITY OF SOLID WASTE AT ASPIRING GEOPARK SUNDA

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The waste problem is one of the big challenges for sustainable development in Indonesia. According to the World Population Review, in 2021 Indonesia was the fifth largest contributor of plastic waste to the sea. Therefore, the Government of Indonesia encourages the application of circular economy to promote sustainable economic development while improving environmental quality. It is acknowledged that the circular economy approach can be implemented through initiatives from the public, potentially in communities with a high sense of community. The focus area of this research, MukapayungGeosite, is part of the SundaGeopark. While running as a tourist destination, this geosite must address waste management issues as part of its conservation efforts. This research observes the impact of the benefits of local waste management. Through a qualitative approach, this study conducted semi-structured interviews with actors who contributed to waste management in MukapayungGeosite. The results show that a community-driven waste management system not only contributes to protecting the environment, but also provides socio-economic benefits back to the community. This is made possible by the actor's intention to support common interests. This research provides insight into how the application of circular economy from the common public can still have an impact on the local social and economic dimensions. Emerging initiatives and policy makers in developing countries can use this research to promote the use of the circular economy to achieve sustainable development goals.

SUNDANESE CULTURE-BASED CONSERVATION: AS EDUCATIONAL MODEL FOR CHILDREN IN ASPIRING GEOPARK SUNDA, INDONESIA

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Mount Sunda is the 'mother' of several mountains in West Java Province, formed from volcanic processes around 500 to 560 thousand years ago. This mountain has experienced two significant eruptions, producing the Sunda Caldera, which occurred between 0.205 and 0.18 million years ago. The results of the identification and research carried out as a result of the long volcanic process of the Ancient Sunda Mountains have left various natural heritages in the form of Geosites and are collected in the Sunda Geopark area. There are 98 Geosites spread over 63 villages in West Java Province.

Aspiring Geopark Sunda has the potential to be developed into a Geopark Area with high geological, economic, socio-cultural and environmental diversity values. There is still a long way to go to achieve this, especially in increasing public knowledge. The community as a driving agent in the preservation of the Sunda Geopark Area and is the most important component in creating sustainability. According to John Dewey, children are active contributors and agents of learning, therefore conservation education based on Sundanese culture can be started from the young generation. The learning process will be optimal for children if it can become Experiential Learning. Therefore, making conservation learning books based on Sundanese culture (12 Pitutur Sunda) through interesting animations can be a manifestation of the development of the Sunda Geopark.

The research method used consists of: 1) primary and secondary data collection to determine the overall characteristics of the subject; 2) determining the learning model according to the characteristics of the subject through descriptive qualitative; 3) the formation of an action plan based on four principles, namely learning by doing, discussion, interactive and interdisciplinary. Taking as many as 50 research samples, namely children in the age range of 5-13 years in the Sunda Geopark Area as a Learning Pilot Project which will be evaluated periodically to form an appropriate and effective learning model.

The expected end result is the formation of a sustainable learning model through interactive learning tools such as books for children in the Sunda Geopark Area. This research is a follow-up to participation in the 9th UNESCO Global Geopark Conference in Jeju 2021. This will be a long-term investment to prepare the young generation as 'Environmental Agents' in the Sunda Geopark Area and pass it on to the next generations. We have carried out various series of research to make Aspiring Geopark Sunda a world-recognized Geopark area and have an impact on environmental preservation and community development.

PROMOTING ENVIRONMENTAL MOVEMENT AMONG YOUTH IN GEOPARK SUNDA: THE ROLE OF SOCIAL MEDIA AND LOCAL HEROES

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Sunda Geopark was formed because due to the activities of Mount Sunda, which experienced two major eruptions between 0.205 and 0.18 million years ago. These eruptions formed the Sunda Caldera, which later underwent a long geological process and eventually became 98 Geosites spread across 63 villages in West Java Province. Geopark Sunda has the potential to be developed as a geopark area due to its high diversity in geology, economy, socio-culture, and environment. However, climate change poses a significant threat to Sunda Geopark. Sunda Geopark is traversed by the Citarum River which is known as one of the world's most polluted rivers (Williams, 2013). Changes in precipitation patterns and extreme weather events such as floods and droughts can lead to more or less water flow in the river, affecting the amount of pollutants carried downstream and thus affect the distribution of pollutants. Various community groups, both formal and informal, have launched campaigns and actions to clean up the Citarum River. Currently, more people are aware of the impact of climate change on human and the environment, and this has led to the growth of climate activism movements both locally and globally, especially among young people.

This research applied content analysis and descriptive analysis to social media campaign conducted by Pandawara Group, a content creator group based in Bandung City, part of the Sunda Geopark area. The group actively promotes environmental awareness through river clean-up activities. Within less than a year, the group's activities have attracted the attention of many young people of Indonesia through various social media platforms such as TikTok, Instagram, and YouTube. The results of the study show that the social media activities of Pandawara Group align with the Uses and Gratifications framework, encompassing entertainment, integration and social interaction, personal identity, information, and empowerment. Through this research, insight is gained into how the ability to utilize social media can encourage young people's interest in environmental actions.

EVALUATION AND VALORIZATION OF GEOHERITAGE: CASE STUDY OF IDA MADRA GEOPARK (TURKIYE)

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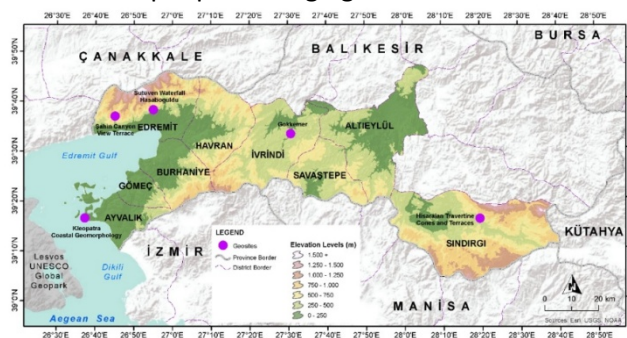
Conservation and local development are among the main objectives of geoparks. The most important elements of geoparks are geoheritage sites. These may include geological, geomorphological, natural and cultural elements.

The geosites in the Ida Madra Geopark, which has very rich areas in terms of geology and geomorphology, are of great importance in terms of geoheritage potential. It is understood that the areas that did not have tourism potential before will make a significant contribution to tourism by evaluating and volarization.

The aim of this study is to evaluate the geosites that have little or no importance in terms of tourism before and to contribute to the development of the local people by increasing their importance.

The study consists of primary and secondary data. First, a field study was carried out to determine the geosites selected in the Geopark area and how they would gain value. The geological, geomorphological, cultural and natural characteristics of the areas were examined and each was scored according to the evaluation criteria. Then, based on the findings, geology, geomorphology and tourism maps were created. In the next stage, it was examined how to open the sites to tourism in order to help the development of the local people and what needs to be done was determined. At the end of the evaluation, it was determined how to eliminate the deficiencies of geosites with low scores. In the last stage, the rehabilitation, infrastructure and trekking routes of the site were built; place, direction and information signs have been prepared and placed in appropriate places. As a result of these processes, it was seen that the number of visitors in the geosites increased between 100-1000% in one year. The largest increase was recorded in the Hisaralan Travertine field geosite. Later, an increase in the number of visitors was observed in Hasanboğuldu and Sutüven waterfall, Şahindere Canyon Glass observation terrace. A similar situation has emerged from İvrindi Gökkemer, Ayvalık Cleopatra Coastal geosites.

The results obtained showed that the areas that are less valuable in geoparks can be developed and become more valuable and promote to the local people through geotourism.



DESIGNING OF THE INTERPRETATION SYSTEM OF GEOPARKS WITH THE METHOD OF COMMUNICATION STUDIES

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One of the purposes of establishing a geological park is to carry out scientific research and popularize knowledge of earth science. The geoheritage science popularization and interpretation system is the top priority of science popularization construction. This article summarizes and analyzes the reasons why geoheritage interpretation systems affect the dissemination effect through the study of geoheritage interpretation systems in multiple natural parks and geological parks. The general rules for constructing the interpretation system of geoheritages based on the principles of Communication studies are proposed. The reasons that affect the dissemination effect of geoheritage interpretation systems include: ① the professionalism and ambiguity of geological terminology; Geology is highly specialized, which is not only reflected in a large number of professional terms, but also in the obscure professional knowledge that is difficult to be understood by the public and the special Language construct of complex and difficult to understand expressions ② the vastness of geological history space-time and the limitation of human space-time cognition; 1. On the basis of Communication studies, a multi-level, multi-media and communication feedback interpretation system of the Geopark is constructed. The construction and design of the interpretation system should follow the general laws of Communication studies. 2. General rules of geoheritage interpretation system : 2.1. The principle of 'no more than three'; No more than three new knowledge points on a geoheritage explanation board 2.2 The deduction principle of "from known to unknown"; To use well-known terms to explain unfamiliar terms and nouns, rather than using unfamiliar concepts to explain another unfamiliar concept; 2.3The principle of "graphic spatiotemporal reconstruction"; 2.4 The principle of "literary rhetoric narration"; Using methods such as analogy, personification, parallelism, and rhetorical questions to enhance people's understanding of geological knowledge in terms of expression form; 2.5 The principle of multidimensional media symbols; In the design of geoheritage interpretation signs, "space" is used to represent "time". Time is untouchable and intangible, and it is difficult for ordinary people to understand time, especially geological historical time, with intuitive experience. Therefore, in geoheritage interpretation systems, space is used to represent time.

THE LINKAGE BETWEEN CULTURE AND DANXIA LANDFORM IN LONGHUSHANUGGP

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The LonghushanUGGp not only boasts the typical Danxia landform (also being proposed as red beds landform or sandstone landform) but also known as the birthplace of the cliff-burial culture and the cradle of Taoism. Danxia landform is characterized by red-colored terrestrial clast sedimentary rock and steep cliffs, with caves as the secondary feature. This type of landform developed through long-term erosion. It is located in Cretaceous, rift-related, red bed basins in the 3000 km wide north-easterly trending South China Fold Belt (SCFB). The location of the on the Beihai-Shaoxing Paleo-suture where the two plates of Yangtze and Cathaysia collided around 970Ma -ca. 890 Ma. The linkage between Culture and Danxia Landform in the LonghushanUGGp can be found in the bedding-and-fracture-controlled Danxia landforms with the cultural ruins and sites. Strike-slip fault created the long and steep Danxia Cliff. The tilted bedding dip angles control the Erosion patterns of groundwater in the red beds, which has evolved the big along-bedding caves and used by the ancient people, Thus, the the Birth of Cliff Tomb Culture formed and it also influenced the people's Interpretation of nature. The Luxi River, running across the Longhushan Geopark is a record of a left lateral strike slip fault, which is now a popular Danxia-landform -Geo-trail on water. The towered Danxia peaks are directly related to the fracture controlled erosion with is corresponding to a rift-basin development geological setting. "Tao" is translated as "way" or "rule. The unique Taoism culture derived from the interplay among philosophy, nature and human beings. Taoism has had a profound influence on classical Chinese society and still functions today, and is link with nature is also is the interesting attractions of the LonghushanUGGp to visitors.

POSTER PRESENTATION MODEL FOR ASSESSMENT OF HERITAGE IN GEOPARKS

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Protection of natural and cultural heritage through sustainable tourism in potential geoparks (PRONACTUR) was project financed by Western Balkans Fund and European Commission (under 4th Call for Proposals) in period 2022-2023 (total budget of 20,700 EUR), and duration of 18 months. Goal was to develop tools and assess the significant geological, natural and cultural heritage in protected areas of Western Balkan. Four Aspiring Geoparks were assessed using so called geology assessment model (GAM) by the team, led by experts from the University of Novi Sad, NGO Stena Stenae and Mak Geopark, Fruska Gora from Serbia, NP Piva from Montenegro and Birds of Albania. Main objectives were to utilize the regional natural and cultural diversity as an asset upon which authentic regional tourism brand is increased, to stimulate active cooperation between all stakeholders in nature/environmental protection and nature-based tourism of the WB region and create synergies for product development and knowledge transfer, to understand and assess the risks & threats to natural and cultural heritage from hazards and human-made impacts, including climate change and to use this knowledge to create adequate actions by local governments. GAM Guidebook (promoted at various events) gives a practical ways to assess the heritage in protected areas, determine vulnerability to natural disasters and focus on conservation, as well as ways to implement some Good Practices for Sustainable tourism in Protected Areas and Geoparks. Project assessed risks to 6 geosites in every country, created six separate events (including celebration of UN Disaster risk reduction day and International soil day to raise awareness) and attended several trainings plus one international conference (EGN in 2022). Activities in North Macedonia aligned with the Mak Geopark Action Plan 2021 - 2031 and gave insights of vulnerability of these important heritage sites to various natural hazards. Some 400 stakeholders and more than 1,600 people were reached by the project. Based on the newly developed grading criteria for evaluated indicators, this model could then provide clearer guidelines for identifying important nature-based tourism destinations. It was demonstrated and confirmed by experts this Model has the potential to assist in the sustainable planning and management of natural heritage locations and their transformation into tourism destinations. The model does not require any knowledge of statistics, mathematics or modeling, and is easy to use by anyone with particular skills in tourism management and nature conservation.

THE CONTRIBUTION OF THE 'AROUCA AGRÍCOLA' BRAND FOR SUSTAINABLE DEVELOPMENT IN THE AROUCA UNESCO GLOBAL GEOPARK (PORTUGAL)

Daniela Rocha, Marianna Holz, Mariana Alves, Alexandra Paz, Margarida Belém, António Duarte, Artur Sá

Arouca Geopark Association; Arouca Municipality; University of Trás-os-Montes e Alto Douro

With the aim of maintaining its prominent position as a territory of sustainable and significant development as a geotourism destination, Arouca UNESCO Global Geopark intends to respond to the challenges created by new market trends in supply and demand. As a strategy, a short food supply chain was created with the brand 'Arouca Agrícola'. Since 2017, under this brand were created diverse initiatives as strategies for the preservation and enhancement of agricultural activities, supporting family farming, and encouraging the choice for the consumption of local products, that have a positive influence on the environment, community, health, quality, and local economy.

Currently, the 'Arouca Agrícola' initiative has 65 adherents made up of small local farmers who have transacted through this territorial development initiative more than 90 tons of fruits and vegetables in the last six years. This project works in several areas, such as production, distribution/consumption, communication, and awareness-raising, allowing the disposal of agricultural products. A significant investment is being made in technical training, aiming to a more organized agricultural production for a better yield and sustainable agricultural practices. Due to the negative impacts of conventional agriculture on the environment, in 2019, the 'Arouca Agrícola Bio' started, with the intent to create a nucleus of producers in organic farming, encouraging the conversion to this type of agricultural practices.

Furthermore, an important role is being played to encourage the community towards a more conscious and responsible choice, through initiatives of food production and environmental awareness (education, workshops, tourist programs and field visits to farms) to approach the community to the agricultural reality of Arouca UGGp. In addition to these initiatives, work is being developed with restaurants, cafes, local tourism companies and schools to raise awareness of farmers and local products and, on the other hand, enhance their quality and encourage consumption. Therefore, the stakeholders can integrate local products into their day-to-day consumption and activities. The local products provided in the Arouca Agrícola local market and in the weekly baskets to the consumer are fresh and seasonal or processed products. In a territory with a human history closely linked to agricultural production, we are working in the valorization of the natural and cultural heritage of the region while promoting healthy lifestyles and environmental protection, in line with the global challenges that our Planet currently presents. It has also made it possible to generate family income, preserve agricultural varieties (seeds and fruits), and reduce the ecological footprint of our food, based on more environmentally sustainable choices with less impact, mainly due to the low environmental impact associated with the transport of raw materials.

AROUCA GEOBOX: TOURISM RESOURCE FOR ACTIVE COOPERATION WITH STAKEHOLDERS IN THE AROUCA UNESCO GLOBAL GEOPARK (PORTUGAL)

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On its 15th anniversary celebration, the Arouca Geopark Association (AGA) launched a new version of a gift box – Arouca GEOBOX - that aims to promote and encourage the territory's tourist offer consumption. Inside this box, in addition to a brief territory presentation and to its terms and conditions, there are a set of selected vouchers with different values that can be used on the products, or touristic services of the 25 participating members. Each partner is identified by its own promotional card which is distributed in the following categories: 'where to sleep' (accommodation), 'where to eat' (restaurants), 'what to do' (entertainment companies), 'where to shop' (handicrafts and processed products – regional and conventual sweets and liqueurs), 'what to visit' (attractions – museums and interpretative units, Paiva Walkways, 516 Arouca). Thus, in addition to the inherent advantage of the tourist offer, this becomes an innovative resource for the promotion of these partners.

This new edition of the GEOBOX was designed and produced by an artisan from the AroucaUGGp, under the premise of sustainability; therefore the materials used are exclusively natural: wood agglomerate box and cards made from 100% recycled material.

This initiative intends to establish a closer connection with partners. In this way, there is a mutual and public recognition of the partnership, encouraging the increment of new and more diversified partnerships and facilitating the increase of the visibility of the offer in the territory. Being an attractive box, it can be used for multiple purposes, particularly as an offer by the companies and/or inhabitants to customers, friends and/or family, who live outside the territory and who, in this way, are invited to experience the singularities of AroucaUGGp.

The Arouca GEOBOX can be purchased through the Arouca Geopark online store, at the House of the Birthing Stones and at the Arouca Interactive Tourism Store.

PROGRAMS 100% RESPONSIBLE – TOURISTIC PROGRAMS FOR SUSTAINABILITY IN PORTUGUESE UNESCO GLOBAL GEOPARKS

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The five Portuguese UNESCO Global Geoparks (Naturtejo, Arouca, Azores, Terras de Cavaleiros and Estrela) worked together with the Tourism of Portugal, the Portuguese National Tourism Authority, since 2020, with the aim to develop tourism products and services, improving the Geopark's tourism offer and also to promote the UNESCO Global Geoparks (UGGps) label and concept.

Recognizing the importance and common goals of creating a sustainable destination in Portugal and, in particular in the Portuguese UNESCO Global Geoparks, the Tourism of Portugal challenged the Geoparks Management Structures to involve their private company partners in the initiative of the creation of the Programs 100% Responsible.

The Programs 100% Responsible are touristic programs which have the following main goals:

To differentiate tourism programs through the adoption of environmental and social sustainability practices, and health safety practices;

-To increase the sustainable and safe offer by the private adherent partners of the Portuguese UGGps;

To position Portugal as a sustainable and safe destination, through activities in nature, namely in Portuguese UGGps, thus responding to the challenge of the Portuguese Tourism Strategy 2027, the Sustainable Development Goals (SDGs) and the post-COVID19 recovery.

These programs are managed by three guiding principles: i) manage for sustainability; ii) reduce environmental impact; iii) maximize benefits for local communities. At this moment (June 2023) all Portuguese Geoparks have joined this initiative and a total of 48 programs and 11 partners are involved. The Programs 100% Responsible guarantee, by the private companies that promote them, the adoption of a set of sustainability requirements that are perceptible and understood by their customers. The private partners are also encouraged to apply the sustainability principles with continuous improvement efforts.

The Portuguese UGGps intend to capacitate the partner tourism agents about the importance of developing their activity in a sustainable way and involve them in the promotion of Geoparks as territories of sustainability. The existence of the Programs 100% Responsible promoted by the Portuguese UGGps partners is an action planned in the Sustainable Tourism Plan+2023 of the Tourism of Portugal

PROMOTING THE UNESCO GLOBAL GEOPARKS LABEL AND GEOTOURISM DESTINATIONS IN PORTUGAL

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1.Arouca UGGp, - 2.Naturtejo UGGp, - 3.Azores UGGp, - 4.Terras de CavaleirosUGGp, - 5.EstrelaUGGp, - 6.Tourism of Portugal

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Since 2020, the Portuguese UNESCO Global Geoparks (Naturtejo, Arouca, Azores, Terras de Cavaleiros and Estrela) have a common strategy for geotourism in Geoparks, together with the Tourism of Portugal, the Portuguese National Tourism Authority. The aim is to develop tourism products and services, improving the Geopark's tourism offer and also to promote the UNESCO Global Geoparks' (UGGps) label and concept. Aspiring Geoparks have been participating in the working group in order to be able to start developing sustainable tourism strategies in their territories from the early stages of their application projects. The working group has monthly meetings to articulate strategies.

In addition to creating common products such as the 'Code of Conduct and Best Practices', the 'Clean & Safe' seal, Training Courses, '100% Responsible Programs', the 'Scientific Research Portfolio Catalog', there has been a strong focus on promotion at tourism fairs. Tourism trade fairs provide an important promotional platform for tourism industry professionals as also potential visitors and tourists. Participating in these events helps Geoparks to raise their profile and increase UGGps brand awareness. Besides, trade fairs are also key to keep up with the latest trends and developments in the industry and also to meet and network with national and regional authorities, tour operators, travel agents, hoteliers, destination management companies, and other.

In 2022, the Portuguese UGGps participated together in BTL - Lisbon International Tourism Fair for the first time with a common stand. BTL is recognized as the most important event in the Tourism sector in Portugal, having returned after two years of forced interruption, when the sector was slowly starting to reopen after the pandemic.

The Geopark's stand received the special visit of the President of the Republic of Portugal and of the Minister of Territorial Cohesion, as well as many other national and regional representatives. The Hosted Buyers Programme, a 'speed networking' format, allows each Geopark to have meetings with several international buyers looking for specific destinations, segments and products. In 2023 the common participation was successfully repeated, focusing on the Sustainable Development Goals, with new strategies for children under the BTL Kids Route.

In parallel the Geoparks started to participate in regional fairs, such as the Tourism and Hunting Fair in Terras de Cavaleiros UGGp, including seminars and round tables.

Promoting UGGps fosters the socio-economic development of these territories and promotes geoconservation, ensuring that the geological heritage, the key sites of the Earth history, are accessible for future generations.

SCIENCE COMMUNICATION IN UNESCO GLOBAL GEOPARKS

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Research in science communication has brought many contributions to improving society's relationship with science, unfortunately very little incorporated in geoscience communication.

Science communication and public engagement are among the main priorities of UNESCO Global Geoparks, privileged territories for science, culture, education, and sustainable development. Geological heritage of international relevance, integrated strategies for geodiversity, together with geoscientific research and geoconservation make UGGps ideal arenas for effective geoscience communication.

Today 197 UGGps in 48 countries are developing tremendous endeavours to bring society closer to science, being a reference for the communication of geosciences on a global scale.

In this sense, we start to study these contexts, conducting a comprehensive analysis on science communication practices in UGGps, including literature review and documentation analysis. This stage has already revealed a great variety of strategies, tools, approaches and terminology, which allowed the identification of theoretical communication models and paradigms. Besides it was also possible to recognize the diversity of terminology and different understandings or scopes referring to science comunicação.

In a second phase, a benchmarking methodology is being conducted to strategically analyse best practices in selected Geoparks. The data collection includes site visits, direct observation and interviews applying specific data collection instruments for qualitative analysis. This more refined analysis of the territories is finding relevant strategies and solutions, regarding situ interpretation, hands on modules, films, digital and augmented reality tools, targeted communication, and storylines, among many others.

This study is part of a larger project that included the identification and discussion of the main challenges on geoscience communication (Rodrigues et al 2023a) and the study of the representations and practices of geoscientists (Rodrigues et al 2023b). Previous and new results will be integrated in order to develop a strategy to promote, stimulate and improve geoscience communication, addressing the identified challenges and meeting the specific segmented needs. Although the strategy to be developed fits into the specific context of Geoparks, we think that this kind of strategy, currently non-existent even in other areas, could contribute as a reference for the promotion of geosciences and the sustainability of planet Earth on a global level, and could be used as a parameter in UGGps, but also in other contexts.

LIVING SCIENCE IN NATURTEJO UNESCO GLOBAL GEOPARK (PORTUGAL)

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The Living Science Center of the Forest is the main interactive science and technology museum in Naturtejo UNESCO Global Geopark (Portugal). Since its opening in 2007, it has been a fundamental platform for public engagement with science and environmental education in the Geopark. The Center is part of the national network of Science Centers promoted by Ciência Viva (= 'Living Science'), the National Agency for Scientific and Technological Culture. Given its geographical setting (Proença-a-Nova), in a large forested area in central Portugal, the Centre's main focus is the forest, as a source of knowledge, and its mission is to raise awareness of the richness, diversity and fragility of the forest. Located in a region often affected by mega fires, which have been occurring more and more frequently, the Science Center plays a fundamental role in raising awareness of the risk of fire and supporting local communities preventing disasters and becoming more resilient.

The Living Science Center and the Geopark work intensively on the connection between local geodiversity, geological heritage, forest and environment. In addition to the permanent exhibition, which includes local geology, there have been temporary exhibitions, some itinerant, on rocks and minerals, palaeobotany, mining and native forest. The educational programs include workshops and experiential activities, visits to geosites and 'talks with the geoscientist'. Regarding formal education, certified training courses for teachers on biodiversity and geodiversity are provided, addressing the educational tools and resources of the territory.

One of the most successful annual activities is 'Living Science in Summer', a successful national program that takes science out of scientific institutions, into the streets, into the beaches or into the nature, for astronomy, biology, geology, history and heritage activities. Every year, from July to September, the Science Center and the Geopark have been organizing dozens of activities, involving hundreds of participants, walking, visiting geosites, panning for gold, cooking fossil cookies with solar energy, discovering the native forest or tasting waters. Also the 'Ciência Viva Journeys', scientific tourism programs at national scale, comprise a circuit that includes the Living Science Center of the Forest and the main geosites around. At the same time, throughout the year several events are celebrated together, like the Earth Day, Geodiversity Day or Geologist's Day, with initiatives targeted for different audiences, such as students, families or tourists. With all these strategic actions the Living Science Center and Naturtejo UNESCO Global Geopark bring science to the public, addressing the dynamics, history and climate of the planet's past and urgent environmental challenges, contributing towards a more resilient territory and sustainable solutions.

A LANDSCAPE VISION AS AN INSPIRING FRAMEWORK FOR DEVELOPMENTS AN EXAMPLE FROM THE HONDSRUG, NETHERLANDS

Gretha Roelfs, *De Hondsrug Unesco Global Geopark, Netherlands.*

The Hondsrug is a unique area with a rock-solid identity. One of the reasons it was awarded the status UNESCO Global Geopark. Given the challenges currently facing the Netherlands and the Hondsrug, it is of great importance to think carefully about the way developments can contribute to strengthening the identity of the area. This is not an easy task: we are facing energy transition, a housing task, the consequences of a changing climate, the agricultural transition and the restoration of biodiversity. In addition, the government states that water and soil must guide spatial developments. Last-but-not-least, it is important to preserve and strengthen landscape quality and to work towards sustainable recreation and sustainable mobility. Choices will have to be made to steer developments into the right direction. So that people can live comfortably, entrepreneurs have room to do business and we can all continue to enjoy nature and the special landscape with its impressive history. A good basis for all this is a Landscape Vision. This landscape vision should be a framework and inspiration for an integrated approach to tasks and projects. That is, the vision provides, among other things:

direction to preserve and strengthen the regional characteristics and qualities of the Hondsrug area
inspiration for dealing with the effects of climate change perspective for agriculture in connection with the surrounding landscape, so that biodiversity and landscape quality can increase
inspiration for incorporating renewable energy generation, sustainable mobility and sustainable recreation design principles for the integration of urban and village fringes into the landscape.

The Landscape Vision will be developed together with stakeholders and inhabitants. For that reason we organize three so-called Hondsrug days.

In the presentation I will give examples of design principles, directions, and inspiration based on the landscape qualities of the Hondsrug.

ROCKING THE BOAT WITH A NEW GEO-TOURISM EXPERIENCE IN THE DISCOVERY UNESCO GLOBAL GEOPARK

Rolfe Rebecca

Discovery Global Geopark is located on the eastern half of the Bonavista Peninsula on the east coast of the island of Newfoundland, Canada. Discovery is positioned along a highway route known as the Discovery Trail. The geographic region is approximately 3 hours from the capital city of St. John's. The Geopark covers an area of 1150 km² and spans over 280 km of rugged, untouched, coastline. This historic region is known for its colorful cultural and enchanting stories. Adventure awaits as you travel along scenic driving routes, explore national and provincial attractions, hike, boat, and breathe in the breathtaking coastal scenery and dramatic rock formations. With rocks over half a billion years old, the region is host to some of the most spectacular and exceptionally preserved Ediacaran fossils anywhere in the world. As a site of continuing scientific research, new discoveries are still being made, including the recent find of *Haootia quadriformis*: the first fossilized evidence of muscular tissue, and possibly the oldest fossilised animal.

Geotourism is an ever-growing niche in this region. Because of its geological history, Newfoundland and Labrador's Geology is incredibly diverse and interesting. In 2016 29% of visitors to this province took in geological tours or fossil observation on their trip. Visitation statistics show that geotourists to this region typically spend more and stay longer than the average visitor. Geotourists in Newfoundland and Labrador are more likely to participate in outdoor activities including hiking, walking, visiting parks and nature preserves and bird watching. They also show a significantly higher interest in cultural activities including historic sites, museums, galleries, exploring small communities, lighthouses, and local cuisine. (Newfoundland and Labrador Provincial Visitor Exit Survey, 2017).

Sea of Whales Adventures is a premiere tour company operating in the waters surrounding the Discovery UNESCO Global Geopark. This company is a small family owned and operated company specializing in Zodiac boat tours that educate and inspire their passengers. Geological interpretation as it relates to animals in the marine environment has always been part of the Sea of Whales experience, however, with the designation of the Discovery UNESCO Global Geopark, it became apparent that a geology specific tour was needed for the region. Sea of Whales Adventures purchased another boat and worked to create their Rock the Boat Tour. This tour takes passengers to various geological sites within the Geopark explaining their formation, their significance and the importance of geo conservation. This presentation will discuss the successes and challenges of forging ahead with a new geo tourism product in an area where this type of experience was not previously established.

MONETIZATION OF PLACE CAPITAL THROUGH INTANGIBLE SKILLS IN THE DISCOVERY UNESCO GLOBAL GEOPARK

Rolfe Rebecca

The Discovery Global Geopark is located on the eastern half of the Bonavista Peninsula on the east coast of the island of Newfoundland, Canada. Discovery is positioned along a highway route known as the Discovery Trail. The geographic region is approximately 3 hours from the capital city of St. John's, in a rural region with a population of 8200 people. The Geopark covers an area of 1150 km² and spans over 280 km of rugged, untouched, coastline. This historic region is known for its colorful cultural and enchanting stories. Adventure awaits as you travel along scenic driving routes, explore national and provincial attractions, hike, boat, and breathe in the breathtaking coastal scenery and dramatic rock formations surrounded by a colourful built landscape of thousands of wooden buildings dating back centuries. With rocks over half a billion years old, the region is host to some of the most spectacular and exceptionally preserved Ediacaran fossils anywhere in the world. As a site of continuing scientific research, new discoveries are still being made, including the recent find of *Haootia quadriformis*: the oldest fossilized evidence of muscular tissue, and possibly the oldest fossilised animal.

For over 500 years the local economy of this rural region was based on the Atlantic Cod fishery. In the early 1990's this fishery collapsed which resulted in the collapse of the local and regional economies. Before this collapse, alongside the once successful fishery, had developed a unique culture of trades and skills that worked to create a unique built landscape throughout the Discovery Geopark territory. Forced by the downturn in the fishing economy, towns like Bonavista, the regional capital, set out to build a new economy based on its historic built landscape. Through this revitalization of Bonavista and surrounding communities, redeveloped a need for the teaching and learning of intangible skills and trades in dry stone root cellar construction, stain glass window making, Victorian style millwork/woodworking and others. Once undervalued buildings, outbuildings and stone root cellars and the trades that built and maintained them, have now flourished in the region, exporting their knowledge to other communities trying to revive their own challenged economies.

Today, the Bonavista Peninsula is well known in Canada, and the world, as a rural economic success story and a major part of this success is tied to the unique and historic built landscape covering the rocky cliffs and coastal plains. This unique landscape is directly tied to the intangible skills and knowledge that built them and now the rebirth and teaching of that knowledge is key to the long term success of Discovery Global Geopark and its people.

FOR A UNESCO LABEL GEOPARC CAP D'AZUR

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Territory concerned



1/3 of the surface area of the Alpes Maritimes department (France) with some forty remarkable sites

-Including sea, coast, middle and upper country

- A pivotal geological zone, summarizing 400 million years of Earth history, which saw the formation of the Variscan chain, the Mediterranean Sea and the Alps, and presenting a high level of geodiversity.

A territory endowed with:

- * a rich and original geological heritage
- * a landscape heritage of great diversity
- * a remarkable cultural heritage
- * conferring it with an exceptional nature and a universal interest
- * enabling it to apply for the "UNESCO GLOBAL GEOPARC" label

A label that would encourage the development of green tourism aimed at enhancing the environment and preserving the most characteristic traces of the Earth's history.

B. A unique opportunity

The recognition of our particular identity

An entry into the global GGN network would enable direct international contacts and exchanges

An opportunity to strengthen our economic development capabilities

A gateway to international year-round nature, culture, science and heritage tourism.

Access for young people to introductory courses and training in Life and Earth Sciences. (SVT).

Understanding the geological past means understanding the biological present

ZHANGYEUGGP, A NEW ENGINE FOR LOCAL SUSTAINABLE TOURISM DEVELOPMENT

Miao RONG, Pengxian ZHU

Located in the middle of Hexi Corridor, Zhangye is an important business town of the ancient Silk Road. The unique geographical location has brought rich tourism resources to the city. As the most dazzling world-class brand in Zhangye, Zhangye UNESCO Global Geopark plays an extremely important role in boosting local economic development. Since 2020, the management body of ZhangyeUGGp has carried out a series of work in Geopark heritage protection, scientific popularization, tourism development, cultural research, strategic cooperation, etc. Adhering to the principle that heritage should not be damaged, ZhangyeUGGp has established a normalized geoheritage protection patrolling system, promoted the protective legislation and the *Regulations on the Protection of Colorful Hills of Zhangye* has been promulgated. Actively seeking cooperation on scientific research, a series of popular science books and videos have been written and produced. Valuing indigenous knowledge, cultural research and inheritance activities have been carried out, the light and shadow performance *Alan Lagda*, an innovative story derived from the Yugurs, has been successfully launched. Setting tourism standardization system and providing the platform for capacity building, the *Basic Standards and Norms for Tourism Services* has been compiled and released. The tourism attraction of ZhangyeUGGp has been increasing, the tourist reception in Zhangye City has been rising, and the ZhangyeUGGp has gradually become a new engine for the economic development of Zhangye, Especially for the sustainable tourism development in the Geopark.

EDUCATIONAL PROGRAMS OF THE “INDUSTRIAL EDUCATIONAL MUSEUM” AND THE LAVREOTIKI UGG

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"Scientific research on the Lavreotiki landscape originated about 200 years ago. By 2023, the bibliography on the topic already totaled over 300 titles and an immense scholarly interest in the area of the geopark and its geological, mining, metallurgical, cultural, historical, archaeological, and environmental value began to develop. The unique mineralization and the exploitation of silver-rich lead ore during prehistoric and modern times were always in the spotlight of the local community. Therefore, successful efforts had been made to simplify the scientific knowledge and create educational programs addressed to students and the general public.

In 2003, an innovative museum was founded in the geopark's territory, named the “Industrial Educational Museum”. It operated in the monumental complex of the historical buildings of the French Mining Company of Lavrion (today's Technological Cultural Park of Lavrion). It offered a series of experiential educational, creative, and sightseeing activities, linked to various aspects of the geopark's industrial, scientific, and technological interest. With an emphasis on the unique mining heritage of the Lavreotiki UNESCO Global Geopark, many educational programs were implemented. The museum placed its educational role and the active participation of visitors at the heart of its activity, creating a “learning lab”.

Today, the museum's and the geopark's common goal is for every visitor to be able to forge a fruitful interaction with known and unknown themes and objects, as well as with the very processes of learning. The majority of the programs offer a unique perspective on various aspects of the mining heritage of the Lavreotiki UGG, giving participants the opportunity to take action and play a central role. For example, during the program titled “The importance of Cape Sounion”, the participants get to collect evidence on the strategic importance of this special place as a stronghold of mining activity and create a visiting guide for anyone interested. Or, participants in the program “How ancients produced silver and lead” study and reconstruct, through relevant findings and suitable educational material, the productive method of these metals in the ancient Lavrion workshops, and afterwards discover their uses in creating objects such as coins, loom-weights, building joints for architectural elements, etc. In all these fields of activities and many more, the Industrial Educational Museum builds bridges across different cultures and people and conserves the geopark's tangible and intangible heritage for the next generations."

PROMOTING STRATEGIC ACTIONS IN MIXTECA ALTA UNESCO GLOBAL GEOPARK BASED ON THE PUBLIC PERCEPTION OF THE TERRITORIAL SUSTAINABILITY

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The Mixteca Alta UGGp, recognized in May of 2017, is located in the south of Mexico, being a territory composed of nine municipalities of the Oaxaca State with a total area of 415 km². A year after its recognition, a study was carried on regarding the public perception of the immediate impacts of the UGGp on local territorial development. This study was based on workshops and questionnaires applied to the local stakeholders, with questions that considered several targets of the Sustainable Development Goals (SDGs).

Among the findings of the above-mentioned study was identified that more than 80% of the respondents agreed that the UGGp contributes more to SGDs 10, 5, 17, and 8 (reduction of inequalities, gender equality, partnerships for development, and economic opportunities).

Moreover, were identified the top five targets that contributes more for the SDGs. They are *i*) the 11.4, about the protection and safeguard of the natural and cultural heritage; *ii*) the 16.6, regard to the UGGp management as and effective, accountable and transparent institution; *iii*) the 16.7, concerning to ensure responsive and inclusive representative decision making; *iv*) the 8.9, about the promotion of a sustainable tourism; and *v*) the 2.3 regarding to the support for the small scale food producers and their income.

On the other hand, the participants also identify that among the priorities for improving Sustainable Development in the territory was the need for more employment, environmental protection and resilience to climate change, sustainable production and consumption patterns, and quality education (SDGs 8, 15, 12, and 4).

Considering this reality, was possible to conduct strategic actions to reinforce the local sustainable management taking into consideration the priorities and needs of the territory and its population, according to the local public perception. Some of these actions are nowadays flag projects of the Mixteca Alta UGGp, such as the native seed bank, and the program for waste management, reforestation activities, and educational programs, among others.

This kind of research allows us to understand better the UGGp reality through the local population vision, what is an asset to conduct the resources and decision-making for the UGGp Management Plan. It is understood that a periodic evaluation approach of this kind can be very beneficial to give continuity to local development in an optimized way, and maintaining a coherent management plan for the UGGp upcoming periods.

COMMUNITY PARTICIPATION IN EDUCATION, CONSERVATION AND ECONOMIC ACTIVITIES IN CILETUHPALABUHANRATU UNESCO GLOBAL GEOPARK - INDONESIA

Mega Fatimah Rosana^{1,2}; Dody Achadiyat Somantri²; Adjie Ahmad Ridwan²

1. *Padjadjaran Univesity;*
2. *Ciletuh PalabuhanratuUGGp*

Geopark Ciletuh PalabuhanratuUGGp, has just received "Green Card" status in the first revalidation by UNESCO which was announced in June 2023. This success is inseparable from the participation of all stake holders in the geopark area in supporting various activities in the geopark.

Several examples of activities that have involved or been carried out through community initiatives, such as: Conservation activities are carried out for several activities, such as building a megalodon fossil museum, at the Gunungsungging geosite; turtle hatchery at Pangumbahan geosite; and beach cleaning activities at Palangpang beach, Loji beach, as well as planting mangroves and ketapang at Palangpang beach, and planting coral reefs at the Ujung tile geosite.

Another example is economic empowerment activities including through the development of the Hanjeli tourism village as a center for the cultivation and education of hanjeli (*Coixlacyma-jobi* L) as a food substitute for rice and various processed products as geopark souvenirs. Economic growth through the development of homestay villages in Cimarunjung village, Ciwaru village and Tamanjaya village.

Many educational activities have also been carried out by several schools in the geopark area. One of them is at TegalCaringin Elementary School, which already has a geopark cornerfacility in its school environment, and invites students to learn about geopark through various local games. as well as local cultural education developed at Waluran Middle School in collaboration with the local cultural community.

Some examples of these activities can show the development of the community's economy in the geopark area, with an increasing number of homestay/lodging facilities; restaurants, and other supporting facilities available in the geopark area.

THE VIRTUAL REALITY OF FIELD GUIDES AND ANKYLOSAURS BRINGING OUT ENTHUSIASM IN SCIENCE.

Roy G. Rule, *Tumbler Ridge UNESCO Global Geopark, British Columbia, Canada*

At the Tumbler Ridge UNESCO Global Geopark (T.R.U.G.G), our programming has included topics on supplying healthy lifestyles (Health in Geoparks), Indigenous representation, and following the local school's science curriculum. One of the biggest challenges however, has been how to research sites, educate program participants, and entertain anyone who comes to the geopark.

For many years, both volunteers and scientific advisors have been placing signage and creating small brochures that allow tourists to explore at their leisure, in addition to guided hikes run by the geopark and the Tumbler Ridge Museum. However, we are now attempting to add to that with both our own field guide (tailored to the local geology), and downloadable Virtual Reality tours.

With the field guide, the challenge was to compress material previously written into a neat and accessible format, reducing repetition of scientific concepts (which are in their own chapters and the glossary), cutting down on large blocks of text, and focusing on images. This process was carried over on the VR projects, where audio descriptions were limited to two minutes per tour location, and 'hotspots' were limited to clear fifty word descriptions placed alongside images. In addition, it has become a goal that any tours keep terms clear, fun, and finding a balance between scientific accuracy and entertainment.

INTEGRATING EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD) INTO FORMAL AND NON-FORMAL INTERPRETIVE AND EDUCATIONAL PROGRAMS – A CASE STUDY FROM GERMANY'S UNESCO GLOBAL GEOPARKS

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Implementing the Agenda 2030 and the 17 Sustainable Development Goals (SDGs) into educational and interpretive programs poses didactical and pedagogical challenges because of the inherent tradeoffs between the individual SDGs. In addition to this content dilemma, informal education often occurs in recreational settings, hence providing a rather difficult environment when trying to address complex issues and sustainability dilemmas. Education for sustainable development (ESD) provides the framework to these challenges.

We will present products and outcomes from a 24-months project during which the network of the eight German UNESCO Global Geoparks (UGGs) undertook the journey together with partners to address the above-mentioned challenges. After defining the German UGGs' unique selling points in terms of their heritage and their educational mission, the project focused on developing a matrix that allows UGGs to conceptualize ESD-based contents within the individual parks. Based on this approach, each park has designed and tested an individual pilot ESD programme.

As a contribution to the 10th International Conference on UNESCO Global Geoparks, we want to share the actual products and outcomes from this project in an oral presentation. To demonstrate the process behind the accomplished objectives, we would also be able to run geoparks who are interested in developing similar programs through the multi-stage process in the format of a workshop with 60 minutes (better: 90 minutes) duration.

THE INFORMAL APPROACH OF KNOWLEDGE TRANSMISSION AND PERCEIVED RISK FOR HIKERS IN THE IGHILM'GOUNMOUNTAIN

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Geopark M'goun has proved particularly attractive destination among Moroccan hikers seeking an opportunity for self-challenge. M'goun's peak holds a distinctive representation among other peaks, being known as " The Monster Mountain ", a term that challenges both the training and the knowledge required to practice hiking, and the informality that characterizes this nature sport in a mountainous and Cretan high-risk area. Most hikers seek a recommended informal guide in order to assist them. Being a local or an experienced hiker enables them to provide accompaniment and knowledge to hikers requesting such a service. To investigate this issue, a semi-directive interview was conducted with a group of hikers who had climbed the Ighil M'goun peak in the previous two years. The average duration of the interviews lasted 35 minutes, we proceeded to a verbatim transcription, followed by a thematic analysis from which we were able to identify themes and sub-themes concerning the informal aspect of the Ighil M'goun hikes.

**TRIAL OF WATERSHED COOPERATION EVENT TO COMMEMORATE UNESCO WORLD GEOPARK
RECOGNITION-HAKUSANTEDORIGAWAGEOPARK WATER RELAY AS A CASE STUDY**

Takaaki SAKAMOTO, *University of Tokyo*

On May 24, 2023, Hakusan-Tetorikawa Geopark in Japan was recognized as a UNESCO World Geopark. This Geopark covers the entire watershed area and plays an important role in educating people about the water cycle and the origins of rivers. It is rare to find a Geopark that covers the entire watershed area in Japan and abroad, and it is very important to disseminate information about the Geopark as a site for water education in the world.

The Hakusan Tedoru River Geopark Water Relay was held as a project to promote cooperation within the watershed, and to encourage people to embody the water journey in the wake of the UNESCO World Geopark designation.

Approximately 1,000 residents of the basin participated in this event, carrying melted snow from the Hakusan Mountains upstream, midstream, downstream, and to the sea in water torches for approximately 70 km.

In this presentation, we will introduce the process leading up to the relay, the scene on the day of the event, and the significance of the watershed collaboration.

COOPERATION BETWEEN UNESCO DESIGNATIONS IN THE AZORES UGGP

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Of volcanic origin and located in the middle of the Atlantic Ocean, the Azores Archipelago comprises unique geological, biological, and cultural values that are translated in a “volcanic identity” of the territory and of its’ local community. The authenticity of this territory is internationally recognized through different designations, being one of the few places on Earth that overlap UNESCO designations – 2 World Heritage Sites (Angra do Heroísmo city and the Landscape of the Pico Island Vineyard Culture), 4 Biosphere Reserves (Graciosa, Corvo, Flores, and Fajãs de São Jorge), 13 Ramsar sites, and 1 UNESCO Global Geopark. Each of the referred designations cover different territorial areas, occurring only the overlap of 2 or 3 designations in every given point, which brings great challenges that reflect the need to create synergies and articulated management systems.

Considering that the Azores UGGp corresponds to the broader designation that includes the entire territory (9 islands – 1 Geopark), it assumed itself as the aggregating element, taking the initiative to partner with the management structures of the other designations, materializing this networking into common activities and communication strategies, exchanging knowledge, good practices and valuing the territory. Some of the most emblematic activities/initiatives:

- Outdoor activities like walking trails and geosites routes that communicate the values of the overlapped UNESCO designations;
- (Geo)Urban Route of Angra do Heroísmo, brought an improbable look to the WHS of Angra do Heroísmo, bringing together art, history, culture, and geodiversity in an activity that was rapidly transformed into a powerful educational resource and a genuine touristic offer;
- Common area to promote networks in the Visitors Centre of Furna do Enxofre – this interpretive centre is in a geosite of international relevance, which is also the nucleus zone of the Biosphere Reserve of Graciosa Island, so the Geopark Corner was transformed into an area to promote UGGp, MaB and the associated networks.

Having in mind ODS nº 17, the Azores UGGp assumes that together we are more efficient, and through synergies, these UNESCO designations perform their true functions – tools for sustainable development.

Key words: UNESCO Global Geopark, Biosphere Reserves, World Heritage Sites; Ramsar sites, partnerships, sustainable development

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ARARIPE UGGP AND THE STRATEGIES OF GEOEDUCATION, GEOCONSERVATION, GEOTOURISM AND REPATRIATION IN PLÁCIDOCIDADE NUVENS PALEONTOLOGY MUSEUM

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The UNESCO Global Geoparks program seeks to develop territories in a sustainable way through education (Geoeducation), protection (Geoconservation) and promotion (Geotourism) of geological/paleontological heritage present in it. Within this scope, Araripe UNESCO Global Geopark, through the Plácido Cidade Nuvens Paleontology Museum, has constantly sought to approach communities so that they understand the value of the territory they inhabit, institutional partnerships with public and private sectors in order to protect and recover the paleontological heritage in the region and widely disseminate such actions and results to promote the Araripe territory as a tourist destination. Such actions have proven to be assertive and the results achieved have been surprising. The Expanded Museum project has accessed several locations, especially in the Municipality of Santana do Cariri, taking the Museum to the communities and working on identities and belonging; the campaign “a place for a fossil is in the Museum” has been widely accepted, adding up to 2,171 fossils spontaneously donated to the MPPCN in 5 years; the training program for the educational staff has had significant results with a large feedback from visitors to the domain, content and versatility of the guides (children and teenagers selected based on performance in municipal public education) who are trained in geology, paleontology, history of region, English and Brazilian Sign Language (LIBRAS); and actions to rescue and repatriate paleontological heritage in the region, which reached its peak with the return of the dinosaur *Ubirajara jubatus*. The return of *Ubirajara* in particular was a moment that was highly celebrated regionally, nationally and internationally, as it represented a milestone against scientific colonialism, a victory for the people of the territory, which now has back a symbol of its identity and a victory as a strategy for development of the region associated with the Araripe UNESCO Global Geopark. The potential of “Ubiraja” to boost the development of the region can be expressed in 700 visitors to the fossil exhibition in just four days in the auditorium of the AraripeUGGp. In this context, the role of the territory's assets for their development becomes clear when located in situ, refuting theories to the contrary that claim that ex situ strategies would be more important.

THE SERIDÓ UNESCO GLOBAL GEOPARK ON THE AGENDA 2030 IMPLEMENTATION: 2022'S ACTIONS IN A SUSTAINABLE TERRITORY

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The 2030 Agenda for Sustainable Development Goals of United Nations (SDGs) are the guidelines to implement sustainability in UNESCO Global Geoparks (UGGps). In this way, some geoparks and networks had been trying to understand what are themselves contributions for the 2030 Agenda. The SeridóUGGp is a territory recognized in 2022 and composed by Acari, Carnaúba dos Dantas, Cerro Corá, Currais Novos, Lagoa Nova and Parelhas municipalities, with a 2,802 km² area, inside the Brazilian Northeast semi-arid. Created in 2017, the Public Intermunicipal Consortium Seridó Geopark (PICSG) is the entity responsible to manage, within the local representatives, technical and scientific committees, and promote actions in favor of sustainable development for SeridóUGGp community.

The geopark stakeholders' perspective about promotion of SDGs was published in 2021, in this survey the highlight was in SDGs 17, 15, 4, 8 and 11. Although this, it is necessary expand this research and analyze through the 2022's actions applied in the territory to comprehend the SDGs' contributions to turn the geopark even more sustainable. In order to evaluate the SDGs was used the 2022's Report of Actions of the territory, that compiled all the activities promoted along this year, especially registered in the geopark's social networks. To comprehend the impact of each SDG implementation inside the SeridóUGGp's actions, each initiative registered in the report data was classified according your SDG main purpose, e.g. geoeducational event in a school for SDG 4, or partnership with artisans for the SDG 8.

In 2022, the SeridóUGGp staff developed in favor of their territory 230 different activities, an average of 14 initiatives per month. The most implemented goals were the SDGs 4 (37%), 8 (19,6%), 17 (14,3%), 9 and 11 (6% each one). In this SDG, it can be highlighted the educational major project "Five senses of Seridó Geopark" with many planned actions during the year. For the second most implemented goal, the 8th one, there are some initiatives, such as: meeting with government representatives, stakeholders, geopark's staff, another geoparks and partners; release and idealization of touristic programs; consortium general assemblies; regional and national tourism expeditions; forum and fairs participation; touristic signs project; nature documentary record; and geotourism local guides formation.

The others SDGs also were promoted in the territory, as the 17th in the media participation, partnerships and integration with another sustainability actors, and e.g. the 9th and 11th implementation with entrepreneurship events participation and execution of "Seridó Geopark Leaderships" territorial program of development. It is possible group the actions in two main blocks. The first one with a major peak of activities on the SDGs 4, 8 and 17 in a range of 14-37% of all initiatives. The other block with SDGs 9, 11, 12, 13 and 16 performed a similar 3-5% average. The analysis suggests a future targeting of actions in the second block and also the SDGs 1, 2, 3, 6, 7, 10, 14 and 15. This methodology could be applied as way to monitor the SDGs implementation in the Seridó and others geoparks territories.

Key words: monitoring, sustainability, management

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THE FIRST INTERNATIONAL GEODIVERSITY DAY IN THE AMERICAN UNESCO GLOBAL GEOPARKS

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The initiative of creating an International Geodiversity Day (IGD) came after the Geoheritage Virtual Conference, in 2020, where four of the conference delegates called for its establishment. After that, The IGD was proclaimed by UNESCO at the 41st General Conference in 2021. This annual event is celebrated on October 6th aiming to highlight the significance of geodiversity in our daily lives and to encourage people to take action to protect and conserve the Earth's geological heritage.

The day is celebrated with various activities, such as field trips, lectures, exhibitions, and workshops, organized by geological organizations, educational institutions, and conservation groups worldwide. In this sense, the participation of geoparks in the promotion of IGD is especially important since the conservation of geodiversity is one of their principles. Hence, this paper has the purpose of analyze the contribution of American geoparks to IGD, gathering data of activities, web posts and others. Considering that only 12% of 250 actions held in 2022, registered in the IGD website, were developed in America and Oceania, it is necessary to investigate how to enhance the participation of Southern Hemisphere countries to celebrate the importance of the geodiversity.

Therefore, the American UNESCO Global Geoparks (UGGps) was chosen to be analyzed in this paper. Thus far, the American continent have two UGGps networks: the Canadian Geoparks Network (CGN), established in 2009 and with 5 UGGps; and the Latin America and Caribbean Geoparks Network (GeoLac), created in 2016 with 10 UGGps.

Data from these 15 UGGps were collected from their social networks, like Facebook and Instagram, and subsequently their importance to each territory were analyzed. Regarding CGN, all UGGps have produced posts celebrating and explaining IGD. Percé, Stonehammer and Cliffs of Fundy UGGps had a collaborative activity, posting a video about their geoheritage. Only Discovery UGGp has realized a presential event, presenting their geofoods and geoproducts. The Tumbler Ridge UGGp presented their own geoheritage, geosites' photographs and explanations.

Regarding GeoLac, 60% of them developed some activities in their social networks. Kutralkura, Imbabura and Colca y Volcanes de Andagua UGGps did not publish initiatives, and Rio Coco UGGp doesn't have an active social network. All activities promoted are related to educational purpose, bringing youths and/or local community to present the local geodiversity. It is important to highlight the Indigenous People participation on the Mixteca Alta UGGp; Araripe, Seridó and Grutas del Palacio had an entire October calendar of IGD activities; The Grutas del Palacio UGGp participated of a collaborative action with other Global Geoparks Network, the IGD Digital Event.

As can be seen, the canadian geoparks have developed an audiovisual approach to promote IGD. On the other hand, GeoLac geoparks demonstrate their role in educational initiatives, approximating community to geodiversity. It is clear that geoparks networks can encourage other territories to promote collaborative actions.

Key words: geodiversity, celebration, networks

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SUSTAINABLE TOURISM, A NEW TOOL FOR THE COLLABORATING ENTITIES OF LAS LORAS UGGP

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Las Loras Geopark, a 1000 Km² wide territory, is situated to the south of the Cantabrian Mountain Range western sector, extending to the north of Burgos and Palencia regions. It was declared a UNESCO Global Geopark in 2017 and it is the only Geopark in Castille and Leon Autonomous Community for the time being. Sustainable tourism and the development of their local communities is one of the strategical priorities for geoparks. Several programmes and actions aimed at fostering and promoting sustainable tourism within the territory have been carried out by Las Loras Geopark. The agreement with the more than 70 Collaborating entities involves sustainability criteria and training related to geotourism. Furthermore, the Geopark is by now one of the tourist destinations included in the Spanish Ecotourism Club and many of the Geopark's collaborating partners are about to be accredited by the Club, and some of them are already accredited by the European Charter for Sustainable Tourism. Las Loras Geopark has a free accompaniment and advisory programme to enable their accreditations.

Other actions related to sustainability are also developed by the Geopark. Such is the case of the carrying capacity plan for a site of interest dealing with high numbers of tourists. Some of the measures aimed for this site are expected to be held soon. Work has also been done with local administration as to apply the criteria in new facilities and infrastructures.

Lastly, "Discovering the Geopark" is an innovative programme of guided visits which has been launched to accompany 30 people, maximum, through some of the geopark's geotrails and visit one of the collaborating entities, such as local producers, beekeepers, restaurants and others. Visitors are shown the main features of their work. The activity has a cost of EUR 5, and the money goes entirely for the partner that offers each of the participants a souvenir in exchange. A local ecotourism partner enterprise is hired by the Geopark to carry out the activity and a Geopark worker accompanies, interprets geological heritage and helps guiding the group.

PROPOSAL FOR THE TAHAMI GEOPARK, COLOMBIA-SOUTH AMERICA

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The Tahami terrane represents a polymetamorphic complex with ages ranging from the Precambrian (?) to the Permian – Triassic, called “Tahamí” based on one of the most important indigenous cultures in the area upon the arrival of the Spanish conquerors (Restrepo, J.J. & Toussaint, J.F. 2020). The Tahami Geopark proposal covers a territory of 2,392 km², with a geological heritage of international interest due to its scientific, educational, and aesthetic value that combines the rich fauna of great biotic diversity, forming a mosaic of primary forest floor covers, with approximately 135 species of herpetos (amphibians and reptiles), 454 species of birds, 117 species of mammals, and 700 species of flora, where geotourism is a way of discovering the valuable assets of the Tahami Geopark (TG). The Tahami Geopark region has great potential to promote local development and poverty alleviation, gain national and international visibility, and raise awareness about geoheritage, in order to encourage local communities to develop innovative geoproducts. There are also wonderful places for the development of recreational activities and enormous potential for the designation of geosites, geotrails, mining museums, as well as geoconservation and geoeducation activities

In the GT; in addition to the polymetamorphic complex of the Central Cordillera of Colombia, igneous rocks belonging to a body called Batholith Antioqueño (BA) outcrop. The canyons of the Alicante and Nus rivers stand out, where caverns have been formed within the marble unit. The one on the Nus River is made up of nine halls whose floor area is approximately 5,750 m. In the Alicante river canyon, the presence of funnel sinkholes is emphasized, where 21 sinkholes have been mapped with dimensions that vary from 90 m in diameter and shallow, to wide depressions reaching 360 m in diameter.

The lithological units of the Antioquia batholith also generate adequate mineral soils that are propitious for the cultivation of coffee and sugar cane used for the production of panela, both typical Colombian products and in particular of this region. Cocoa, another typical Colombian product, is also grown on these soils.

Both geological and geobiotic heritages are remarkable in this region. The combination of geological, cultural, and historical heritage with ancestral knowledge, marked above all by the geological characteristics of the region, is a potential for the development of geotourism.

URABAES GEOPARK: GEOPARK PROPOSAL IN THE COLOMBIAN NORTHWEST

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The proposed Urabaes Geopark is located in the Caribbean coast of the Gulf of Uraba, near the border with Panama. It includes part of the Darien Mountain range, a bridge between North and South America. The geological history of the union of the Americas began in the Late Cretaceous when some island arcs formed in the Pacific Ocean drifted northward and accreted against the Cordillera Occidental of Colombia. The oceanic rocks formed in these island arcs include also the Baudo Mountain range and are called the Cuna Terrain. This terrain was the last to accrete into the Cordillera Occidental, which is also made up of older accreted oceanic terrain. The geological closure occurred in this region of Colombia and is marked by the Dabeiba - Pueblo Rico fault. The closure caused by this accretion is one of the most important geological events in the earth's history. The union of northern and southern Americas by the Darien range triggered a great exchange of fauna and flora and physically separated the Atlantic and Pacific oceans, generating changes in ocean currents and in the world's climate. This geological event occurred between 10 and 3 million years ago and took place in the NW part of Colombian territory.

All geological phenomena in this region, such as marine terraces and coastal erosion, are linked to tectonic forces resulting from the interaction of three tectonic plates: the Caribbean plate, the South American plate, and the Nazca plate. By studying marine terraces, it is possible to better understand sea level changes and climatic variations. The formation of the great delta of the Atrato river in the Gulf of Uraba is a geological phenomenon that generates environmental conditions favorable to great biodiversity unique in the world. The rapid sedimentation of large thicknesses of fine sub-compacted sediments along the Colombian Caribbean coast, coupled with the tectonic forces present in the region, creates diapiric phenomena that produce the mud volcanoes typical of the Colombian Caribbean coast. In addition to the geological and environmental characteristics, this region has a very interesting history, since it is here that the first Spanish city in South American territory, Santa María del Darién, was built. Upon their arrival, the Spaniards were confronted by many tribes who bravely defended their territory. The descendants of these tribes, the Kunas, Emberas, and Zenus live still today in this region in indigenous reserves. Today, large irrigation canals are still visible and are evidence of the organization of the pre-Hispanic tribes. Colombians of African origin also have a strong cultural influence on the Colombian Caribbean coast, where slaves were brought from Africa for centuries.

INDIGENOUS COSMOVISION IN MIXTECA ALTA UNESCO GLOBAL GEOPARK AND NAPO SUMACO ASPIRING UNESCO GLOBAL GEOPARK AND ITS LINK WITH THE SUSTAINABLE DEVELOPMENT GOALS

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Geoparks are powerful tools for territorial management, education, conservation, interaction, and local empowerment, due a wide spectrum of application and development. These principles and conditions are framed with plenty of merits in the aspects outlined in the Sustainable Development Goals (SDG) of the United Nations. Geoparks and the SDGs commit complementary actions to each other, which seek to promote a local and global community benefit.

Geoparks promote and foster traditional ancestral knowledge, considering that many of the geopark territories maintain indigenous groups within their limits. Indigenous peoples keep tribute to the SDG based on their worldview, traditions, customs and life models, therefore, in addition to the efforts and activities carried out by the geopark in favor of sustainability, its inhabitants live sustainability from their concepts, forms of subsistence and their relationship with the environment.

In this work we present the cases of the Mixteca Alta UNESCO Global Geopark (Mexico) and Napo Sumaco Aspiring UNESCO Global Geopark (Ecuador) Geoparks, which in their territorial extensions (415 km² and 1800 km² respectively) shelter important local indigenous groups with ancient cultures, with a vocation and worldview aimed at sustainability: Mixtecos (Mexico) and Kichwas (Ecuador). Their daily actions and activities minimize the ecological footprint, consumerism, globalization and promote food security, equality and conservation of forest, water and soil resources, and concrete actions to improve the global climate.

PARTICIPATORY STRATEGIES FOR THE MANAGEMENT AND CONSERVATION OF GEOHERITAGE IN THE NAPO SUMACO ASPIRING UNESCO GLOBAL GEOPARK (ECUADOR)

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The concepts establish that geoparks are territorial structures with perfectly defined limits, and that fulfill the role of management, education, and conservation, being instruments with a strong impulse towards the development of sustainable productive activities, mainly through geotourism and the promotion of locally manufactured products. In the same way, one of the fundamental bases of the concept of geoparks is the work and management of the territory from "bottom-up", that the local communities are the livelihood and motor for the construction of the geopark in the territory.

Considering that local communities are the driving force of these territories, the strategies promoted to achieve objectives and goals in the short, medium, and long term must be structured by and from local groups, considering that they are the direct beneficiaries. In this sense, what are the effective roles of communities in a geopark? Is the role of local indigenous groups only figurative? How does a community contribute to the goals of the geopark?

In response to these questions, the example of the Napo Sumaco Aspiring UNESCO Global Geopark is considered. Napo Sumaco is a territory located in the Ecuadorian Amazon, possessing an important geological and cultural heritage, and a local population that is representative of the Amazonian Kichwa indigenous, and covers an area of 1800 km². Napo Sumaco management model is based on 3 traditional ancestral Kichwa principles: Minga (joint work to achieve community objectives), Turkana (exchange or barter of objects and work) and respect for Pachamama (conservation of Mother Earth); complemented with scientific and technical knowledge. In this ambit, the present work shares some participatory geoconservation activities such as: monitoring the environmental quality of karstic systems, biological monitoring in caves, mapping caves and caverns, monitoring geosites; as well as activities for the promotion of geotourism and geoeducation, such as: activities of local guides Yuyaiwa Pushak Runakuna, dissemination of gastronomic heritage with the MikushaKawsari ancestral cooking group, and dissemination of ancestral craft techniques with Yachak Awakkuna.

VEGETATION CHANGES IN FUNCTION OF THE SUBSTRATE NATURE IN SIERRA MORENA DE SEVILLAUGG (ANDALUSIA, SPAIN)

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One of the most contrasted evidences in the field of botany is the affinity of many species for certain geological substrates, particularly those with a strong acid or basic reaction, which has served to differentiate at least two large groups of flora: acidophilic or basophilic. One of the first consequences of this evidence is the formation of phytocenotic communities adapted to these different substrates.

The objective of this research project is to investigate the relationship between the flora and the substratum lithology in the UNESCO Global Geopark Sierra Morena de Sevilla: to reveal if there are changes in the flora and plant communities with the change of substrates.

In other to carry this out, 12 areas with different geological substrates were selected for sampling, which served to confirm or reject whether the geological diversity conditions changes in the vegetation cover, expressed through its flora and habitats. In addition, to indicate if there is a singularity of habitats or flora (rare, endemic or endangered) in any of the geological units indicated, which may be susceptible to specific protection.

Periodic visits were made during the spring months, the time of greatest concentration of flowering species, to the 12 geological units to collect data on soils and vegetation and to prepare individualized floristic lists. Since different ecological environments develop in each geological unit, nonlinear transects were established to cover all the habitats present.

Floristic catalogs of the species participating in each one were elaborated to establish a flora habitat relationship in each unit.

With all the data, the flora and habitats of each substrate were described and similarities and differences between each one and the rest were established:

- There are generalist species that appear in almost all sampled plots.
- There is a second group made up of species that are found in at least half of the sampled plots, so they do not seem to have a clear affinity for specific geological substrata.
- A third group is made up of species present in one or two plots (235 flora species). Of these, 148 species are found only in one plot or substrate area. These species can be a priori indicators of affinity for a specific lithology (geology).

These results show the need to deepen this study, with sampling in other climatic seasons, and in other areas with different lithological substrates.

BRIDGING THE GAP USING INFORMATION TECHNOLOGY: MAKING GEOPARK ACCESSIBLE TO ALL THROUGH MAROS PANGKEP GEOLOGICAL INFORMATION CENTER

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This research paper aims to explore the role of the Maros Pangkep Geological Information Center in facilitating scientific education that is accessible to the general public. The center is divided into four zones, each offering a wealth of information through a variety of media formats including images, videos and web applications.

Zone 1 focuses on regional geology and geological history, covering topics such as regional geology, geological history, and the dynamic geological processes that shaped the formation of Sulawesi Island and its southern arm. Zone 2 addresses geological resources and disaster management, which includes subjects such as potential geological hazards, renewable energy sources, mineral resources, and the potential for Maros and Pangkep marble. Zone 3 explores the history of life, including fossil invertebrate biodiversity, evidence of vertebrate life, ancient human presence and migration processes, interrelationships of karst landscapes and life forms, and ancient human and faunal coexistence. Zone 4 modifies the Geopark itself, featuring topics such as maps of the Geopark area, profile of the Maros Pangkep Geopark, and geological heritage in the Geopark area, geotourism potential, and maps of the geotrack route. By leveraging a combination of images, videos and web applications, the Maros Pangkep Geological Information Center provides visitors with easily accessible and engaging educational resources. This paper will analyze the effectiveness of the central approach in socializing scientific knowledge and increasing public understanding of geology.

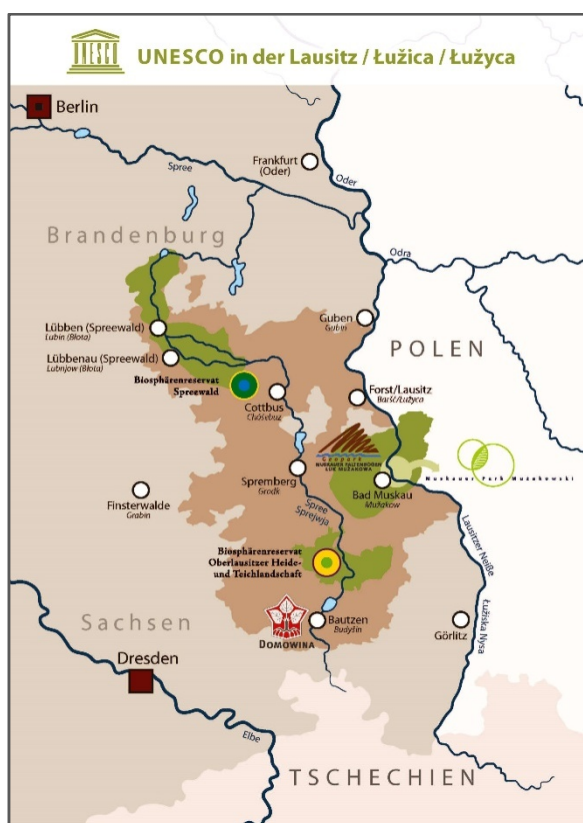
The findings of this research will contribute to the field of science education and provide insight into the use of information technology in making scientific knowledge accessible to a wider audience. Furthermore, recommendations will be provided for the continuous improvement of the Geological Information Center in Maros Pangkep, as well as suggestions for the implementation of similar initiatives in other locations.

GEPARKS AND IMPLEMENTATION OF SUSTAINABLE DEVELOPMENT GOALS.

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The Muskau Arch UNESCO Global Geopark is a partner in a worldwide unique cooperation of 4 UNESCO sites and one intangible cultural heritage. The project is characterized by the overarching association of sites and actors from different UNESCO programme areas and includes



- The UNESCO Biosphere Reserve Spree Wood with its extensive network of waterways
- The UNESCO Biosphere Reserve Upper Lusatian Heath and Pond Landscape with one of the largest pond areas in Germany
- The UNESCO World Heritage Site Muskau Park as a masterpiece of landscape design, and
- The UNESCO Global Geopark Muskau Arch as a witness to the European glaciation and with hundreds of colorful lakes created as a result of the intensive mining and industrial use of the region.

In addition, there are the social customs and festivals of the Lusatian Sorbs throughout the year, which are part of the German nationwide register of intangible cultural heritage. With the Muskauer Park World Heritage Site and the UNESCO Global Geopark, two cross-border sites in Germany and Poland are also involved. Lusatia is located in the heart of Europe and is a region shaped by coal mining and industry. It was most recently affected by a far-reaching structural change in the 1990s, which brought high unemployment, massive demographic

changes and an enormous loss of quality of life.

In order to support the sustainable transformation that is now imminent with the coal phase-out planned for 2038 and thus a second structural change, the UNESCO sites have concluded a cooperation agreement and started a four-year project. It is intended to raise awareness for a structural further development of the region in line with the climate protection goals through educational and mediation formats. In a total of eight joint, coordinated measures and actions, the sustainable development of the entire Lusatia region and the preservation of the quality of life, especially for locals, are the focus of the joint project. In the period from 2023 to 2026, these will also make a concrete contribution to strengthening the Lusatian UNESCO sites for tourism value creation and design and implement educational offers for sustainable development.

THE ROLE OF PROMOTIONAL AND EDUCATIONAL EVENTS IN ADVANCEMENT OF KNOWLEDGE AND EXPERIENCE EXCHANGE IN UNESCO GLOBAL GEOPARKS, ARAS UGGP CASE

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In today's fast-paced world, the exchange of knowledge and experiences plays a critical role in developing and conserving geological, natural, cultural, and intangible heritage. UNESCO Global Geoparks always had exceptional attention to fostering such exchanges through networking. Events and courses organized in UNESCO Global Geoparks contribute significantly to raising public awareness. By hosting workshops, seminars, and conferences, geoparks provide a medium to disseminate knowledge regarding a particular or many regions' heritage, challenges, and activities. Such events create an opportunity for experts, researchers, and local communities to come together and sharing their experiences, expertise, and insights.

Aras UNESCO Global Geopark had the opportunity to host the UNESCO Designation Ceremony with the presence of several local, national, and international authorities. This ceremony served as a knowledge hub where interdisciplinary collaborations and exchange of ideas occurred by bringing together experts from various fields such as geology, geomorphology, ecology, archaeology, anthropology, politics, and economy. These gatherings can facilitate comprehensive discussions and address complex issues related to the sustainable management of geoparks. Participants gain valuable insights through shared experiences, contributing to the advancement of knowledge and innovative approaches. The event helped many people know about the geopark concept in general, Aras UGGp attractions, investment opportunities, and local businesses in local, national, and international levels. Furthermore, the presence of national and international news agencies facilitated transferring this information beyond participants and distributed the news to wider audiences. These capacity-building initiatives contribute to local development, boosting tourism, and fostering a sense of pride and ownership among communities. Participants have the chance to understand and appreciate the rich heritage of the Aras UGGp, fostering mutual respect and understanding. As an instant outcome of this event, it worth to mention that several potential area's authorities declared their interests to establish new geoparks by inviting the experts team to visit the area to begin the project.

As the conclusion, scheduled events and courses organized within UNESCO Global Geoparks like Lesvos Intensive Course, UTAD Summer School, and occasional events like Geoparks Welcome Event or Aras UGGp Designation Ceremony and distribution of these platforms throughout the year, together with providing the possibility of virtual presence, play an indispensable role in the advancement of knowledge and experience sharing. Through active participation and collaboration, UNESCO Global Geoparks continue to foster a sense of unity among individuals and communities, making significant steps toward sustainable development.

TOWARDS A TRANSNATIONAL STRATEGY TO MONITOR VISITOR FLOWS IN THE KARAWANKEN/KARAVANKE UNESCO GLOBAL GEOPARK

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The rising popularity of outdoor activities such as hiking and mountain biking in the Karawanken/Karavanke UNESCO Global Geopark has led to an increase in visitor numbers, particularly in the Petzen and Hochobir mountain areas. This has resulted in various challenges related to visitor management and conservation.

Hikers and mountain bikers have been reported to cause erosion, trampling of vegetation, and soil compaction on trails, leading to the degradation of natural assets. The growing number of visitors and misleading information on outdoor platforms has increased the likelihood of user conflicts. The increase in visitor numbers has led to overcrowding at peak times, resulting in overcrowding at trailheads, as well as creating pressure on the local infrastructure and services. These problems not only have negative impacts on the natural assets and visitor experience but also pose significant challenges for the park management in balancing visitor demand and natural conservation. It is necessary to find effective solutions to ensure sustainable use of these areas while preserving their natural heritage.

The INTERREG Central Europe project HUMANITA aims to establish a transnational framework for visitor monitoring in conservation areas across Central Europe. The framework will be developed by drawing upon effective visitor monitoring practices implemented in conservation areas worldwide, and will be subjected to critical evaluation by various stakeholders, including tourism regions, touristic service providers, conservation experts and institutions, and outdoor app providers. The framework will be tested at the highly frequented areas of the Karawanken/Karavanke UNESCO Global Geopark.

The proposed framework will assist conservation area managers in balancing environmental preservation with visitors' expectations. By utilizing a transnational approach, the framework will promote harmonization of visitor monitoring practices and allow for the exchange of knowledge and good-practices among different conservation areas. The involvement of various stakeholders from the tourism industry, conservation experts and institutions, and outdoor app providers will enhance the feasibility and effectiveness of the proposed framework. The implementation of the framework will support visitor management within the Karawanken/Karavanke UNESCO Global Geopark. Overall, the framework will contribute to sustainable conservation of Central Europe's natural heritage while enhancing visitors' experiences.

VISITOR CENTER MODRA ŠPILJA – BIŠEVO

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The island of Biševo is located in the Vis Archipelago UNESCO Global Geopark, 5 kilometers southwest of the island of Vis. Twenty-two inhabitants live on the 6 square kilometer island which is also known as the island with two Geomorphological Monuments of Nature – The Blue Cave and The Monk Seal Cave. Through the construction project of the Visitor Center Modra špilja - Biševo, scientific data on the geological and geomorphological features, flora, fauna, marine and terrestrial habitats of the Biševo island, as well as cultural and historical heritage, were systematically collected for the first time. As a part of the infrastructural development, the Biševo geotrail, in addition to already established 13 panels, is extended with 12 new educational panels and an abandoned military barrack is renovated. The Visitor Centre Modra špilja – Biševo is located in the central part of the Biševo island, in the former Biševo elementary school, stretching through two stories. The Center was opened for public in August 2022 and it is divided into four parts: educational-interpretative, catering part, conference and accommodation. The results of scientific research on the topic of natural, cultural and historical heritage are presented in a simplified manner using multimedia tools and divided into five thematic sections: 1. The genesis of the island, 2. The blue world - sea caves, 3. Bird migration, 4. Cultural heritage and memory, 5. The island biodiversity. The Visitor Center Modra špilja - Biševo was designed as an integration of natural diversity, karst phenomena, historical and cultural heritage with the aim of raising awareness of the importance of preserving natural and cultural heritage, promoting sustainable development, and represents great potential for the further development of educational programs.

MITIGATING GEOHAZARDS AND ENHANCING BIODIVERSITY

Schüller, Andreas, Kummer, Sabine,

Nature Park and UNESCO Global Geopark Vulkaneifel, Germany

Deviscour, Miranda Climate Protection Management of the district administration Vulkaneifel

Rockeskyll in the VulkaneifelUGGp is a small rural village in the Vulkaneifel Nature Park and UNESCO Global Geopark (Rhineland-Palatinate, Germany). During heavy rainfall events, such as in 2016, large parts of Rockeskyll were affected by severe soil erosion due to the topography and lack of ground cover. Surface water runoff followed relief-driven flow paths and carried loose soil particles to lower lying areas. Large-scale soil erosion occurred in agricultural areas around the village of Rockeskyll.

In 2010, the Rhineland-Palatinate State Office for Geology and Mining classified agricultural land according to its potential erosion risk. The results are used as a basis for agricultural advice, land consolidation procedures or flood prevention measures. The areas identified as potentially at risk largely correspond to the observations made.

A local farmer cultivates several fields of energy crops, some of which have been severely affected by erosion during heavy rainfall events. The most common energy crop is maize, which is highly susceptible to soil erosion because maize roots are very shallow. On experimental plots, the farmer partially abandoned maize cultivation and experimented with the cultivation of the energy crop "cup plant" (*Silphiumperfoliatum*). Unlike energy maize, this is grown as a perennial crop that does not need to be tilled for years. The risk of soil erosion is greatly reduced. After the first year of planting, the cup plant covers the soil in all seasons and has deeper roots. It also has a much longer flowering period than maize, making it more attractive to insects. The disadvantage of a lower energy yield of about 20% compared to maize is compensated by processing the crop using a cavitation system. This technical device crushes the plant particles by means of a turbulent flow. Vulkaneifel UGGp funded this cavitation system to make the switch from maize to cup plants economically viable for the farmer.



Figure 1 : Farmer René Blum, Andreas Schüller, Vulkaneifel UGGp and former county counselor Hans Peter Thiel in the cup-plant fields near Rockeskyll © Natur- und Geopark Vulkaneifel

INTANGIBLE CULTURAL HERITAGE OF CIMMERIAN DOBROGEA ASPIRING GEOPARK

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Located NW of the Black Sea, in Northern Dobrogea South-West of the Danube Delta Biosphere Reserve, the Cimmerian Dobrogea Aspiring Geopark is based on the rich geological and cultural heritage of a mostly rural hilly area. The geodiversity of this area is the result of geological evolution during two major orogenies, Variscan and Cimmerian, as well as of the tectonic processes that led to the formation of the West Black Sea Basin in the Cretaceous. The Geopark territory covers an area of 2528 km², with a population of 146.951 inhabitants.

North Dobrogea is a mosaic of ethnic diversity, which is the result of a tumultuous history. There are several villages with compact communities of Romanians, Russian-Lipovans, Ukrainians, Megleno-Romanians, Greeks, xoraxaj Roma, and more dispersed groups of Turks, Tatars, Italians, Bulgarians. The cultural heritage includes traditional houses, which are still preserved in various stages of conservation in some of the Geopark localities, as well as churches of various religious cults (Christian Orthodox, Roman-Catholic, Reformed, Evangelic, Islamic and Judaic), some of them historical monuments.

Apart sheep shepherding, one of the traditional occupations still preserved in several villages along the Danube is braiding bulrush objects like baskets, boxes, hats, slippers, mats, etc. The intangible heritage includes popular costumes, songs, carols, dances, horse racing, wedding, baptism and burial customs, sayings, recipes, etc. The best preserved intangible heritage is related to various religious holidays.

A winter tradition of the Romanian community in village Luncavița, Moșoaiele represents a group of carolers dressed in furs, with cow bells and scary masks made of painted gourd, horns, flowers and beads. The masks, shouts and sayings of the moșoi drive away evil spirits and attract wellness to local households for the year to come. This tradition is one of the most archaic forms of Christianity.

One of the largest and oldest compact community of Greeks in Romania, established 200 years ago in Izvoarele village, still keeps the traditional Greek customs alive. While keeping the beauty of their customs brought from Greece, the Greeks also borrowed from the traditions of their Romanian and Bulgarian neighbors. A typical custom siLăzărelul, celebrated on the Saturday of Lazarus, the Saturday before Palm Sunday, a custom resembling the celebration of an ancient god of vegetation that died and was reborn every spring.

The Russian-Lipovans, Ukrainians, Megleno-Romanians and Turkish-Tatars are known for their dances, songs, traditional costumes, embroidery and cuisine.

Most of the traditions and customs are slowly dying with the changes brought by modern society and new technologies, interethnic marriages, migration of people abroad and depopulation of villages. The Geopark team is working together with locals and various ethnic communities in order to keep their traditions alive.

POPULARIZATION OF SCIENCE IN GEOPARKS: THE INTERDISCIPLINARY JOURNEY OF TEACHER TRAINING IN HERITAGE EDUCATION OF THE QUARTACOLÔNIA UNESCO GLOBAL GEOPARK

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Recently certified in 2023, the Quarta Colônia UNESCO Global Geopark (QCUGGp) is located in the central region of the Rio Grande do Sul State, Brazil. Spanning an area of 2, 923 km², it encompasses nine municipalities: Silveira Martins, São João do Polêsine, Faxinal do Soturno, Ivorá, Restinga Seca, Agudo, Nova Palma, Dona Francisca, and Pinhal Grande. This territory, renowned globally in the scientific community, stands as one of the foremost Triassic Period fossil deposits, harboring fossils dating back over 230 million years.

In addition to its scientific significance, the region boasts a wealth of cultural aspects derived from the integration of diverse ethnic groups, traditions, and history.

This context highlights the need for an educational foundation rooted in Heritage Education, which encompasses a comprehensive educational process aiming to promote the appreciation, preservation, and management of cultural and natural heritage. The ultimate goal is to foster a critical, participatory, and sustainable awareness regarding heritage and its perpetuation for future generations.

The Education Program (EP) of QCUGGp serves as a catalyst for educational initiatives that emphasize knowledge and preservation within the local community. It encompasses various actions aimed at disseminating scientific knowledge to the population; primarily through formal education in schools.

One of the program's key initiatives is the Interdisciplinary Journey of Teacher Training in Heritage Education (IJTTHE), an event specifically designed for teachers in the basic education network of the Quarta Colônia municipalities. Five editions of the event have already been successfully conducted. The first two took place in 2020, with the first being held in person and attracting 210 participants, while the second was conducted remotely, with 460 participants and over 12,000 YouTube views of the conferences. The third edition, held online in 2021, garnered 354 subscribers and has, thus far, amassed over 4,000 views on YouTube.

The 2022 edition was conducted in person in December, focusing on Paleontology and featuring didactic activities aimed at popularizing the subject among children and teenagers. It drew an audience of 300 participants. The 2023 edition was organized for three days in July, and 500 participants were expected to participate. The 5th IJTTHE edition theme was "Origins", with the objective of exploring the origins of the Quarta Colônia territory in terms of geology, biodiversity, and peoples, considering the territory's occupation and ways of life and mores. It also included a technical field trip, encompassing visits to geosites and tourist attractions within the QCUGGp territory.

The purpose is to familiarize participating teachers with the geosites, enabling them to subsequently engage students in educational activities that facilitate direct contact with the local heritage. Conference speakers and tour guides consist of students and researchers from different institutions and universities in the region. Throughout all the Interdisciplinary Journey of Teacher Training in Heritage Education editions, a wide range of fundamental topics crucial to the cultural and natural preservation of the Geopark's territory have been explored. This event has emerged as a significant driving force in the dissemination of science, particularly among teachers in the region. Through this engagement, teachers are empowered to impart this valuable knowledge to their students, playing an essential role in preserving and perpetuating the rich heritage of the territory.

QUARTA COLÔNIA UNESCO GLOBAL GEOPARK: SUSTAINABLE TOURISM AND LOCAL DEVELOPMENT

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Certified in 2023, the Quarta Colônia UNESCO Global Geopark (QCUGGp) is located in the central region of Rio Grande do Sul State, Brazil. The territory has an area of 2,923 km² and is formed by nine municipalities: Silveira Martins, São João do Polêsine, Faxinal do Soturno, Ivorá, Restinga Seca, Agudo, Nova Palma, Dona Francisca, and Pinhal Grande. In this territory, with a predominantly rural population and beautiful landscapes of preserved nature, live around 62 thousand inhabitants, with one of the greatest cultural diversities in the region.

The territory is the source of a unique paleontological heritage at an international level, where you can find testimonies of the rise of one of the most famous animal groups in Paleontology: the dinosaurs. The sedimentary rocks that support the landscape of this territory, deposited between 233 and 225 million years ago, in the Triassic Period, preserve unique records of a key moment in the history of life on planet Earth. This location also gives this territory a unique landscape heritage, marked by sandstone-basalt escarpments covered by large fragments of Atlantic Forest, still very well preserved.

In the midst of this exuberant landscape, there are many deep valleys carved over thousands of years by the energy of a large hydrographic network that provides the Quarta Colônia with waterfalls, river beaches, and navigable rivers. For no other reason, this territory has served for more than a decade as a reference for ecotourism activities in the center of Rio Grande do Sul. Attracting the attention of tourists, those activities provide opportunities for generating income from the reorganization of production processes and sustainable use of natural resources. In this sense, actions to encourage entrepreneurship and value the natural and cultural heritage, among others, have been vigorously developed in the Quarta Colônia UGGp. Through various qualification courses in the area of tourism and culture, the community seeks to increase awareness of development based on the conservation and sustainable use of the local heritage. Activities such as boat rides in the canyons of Itaúba Dam (fig 1E), long-distance trails through the Atlantic Forest Biosphere Reserve (fig 1B), rural restaurants (fig 1D), hang gliding (fig 1C), and creation of geoproducts (fig 1F) are encouraged and supported as premises of sustainable tourism for the Geopark.



Figure 1: Activities and products of sustainable tourism in the Quarta Colônia UGGp

(CAMINHADASNA NATUREZA): A PROMOTION OF RURAL TOURISM IN THE QUARTA COLÔNIA UNESCO GLOBAL GEOPARK

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In partnership with EMATER/RS Região Central, Nature walks (Caminhadasna Natureza) aims to encourage rural entrepreneurs, stimulate contact with nature and sport, promoting actions in the municipalities of the Quarta Colônia UNESCO Global Geopark. Among the impacts and social transformations provided for the development of the territory are: i) strengthening of local rural tourism – the natural beauty of the region attracts tourists who, by visiting the properties, consequently generate income for rural families and circulation of financial assets in the municipality; ii) health and well-being – reduces sedentary lifestyle by providing outdoor exercise; iii) environmental awareness - contributes to the preservation of the environment and the valorization of the natural areas of the region; iv) strengthening the local rural community – in relation to voluntary participation and organization of the event, there are actions of cooperation and integration among participants; v) promotion of local culture – valuing the traditions and heritage of the participating municipalities; vi) generation of employment and income - through the provision of food, transportation and accommodation services; vii) social inclusion – participation of people of different ages, genders, races and social classes, promoting diversity and integration among participants. That said, the action works with two of the Sustainable Development Goals (SDGs), namely "SDG 11 – Sustainable cities and communities" and "SDG 12 – Responsible consumption and production". The latest walk took place in the municipality of Ivorá/RS, and brought together more than 90 participants from different states of Brazil, integrating people from Rio Grande do Norte and Pará, generating movement in local tourism. In addition, there is an intention to include the Quilombola Communities in the itineraries of the next walks, since the expected is to benefit families from rural tourism in the territory.

EBOOK "PROGREDIR: CULTURA, TURISMO E SUSTENTABILIDADE NO GEOPARQUE QUARTA COLÔNIA"

Jaciele Sell, Angelita Zimmermann, Camila Steinhorst, Wellington Felipe Hack, Jessica Bittencourt Romeiro,
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The "ProgreDir Project Geopark Quarta Colônia," affiliated with the Quarta Colônia UNESCO Global Geopark (QCUGGp), the Subdivisão de Geoparques at Universidade Federal de Santa Maria (UFSM), the Consórcio de Desenvolvimento Sustentável da Quarta Colônia/RS (CONDESUS), and the Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome, aims to enhance professional qualifications and entrepreneurial activities related to culture and tourism within the QCUGGp. The project targets individuals registered in the Cadastro Único para Programas Sociais (a data and information collection instrument designed to identify low-income families for inclusion in social assistance and income redistribution programs), using a non-formal educational approach.

The eBook titled "ProgreDir: Cultura, Turismo e Sustentabilidade no Geoparque Quarta Colônia" encapsulates the accomplishments of the year 2022 by delivering training courses with the collaboration of the Centro de Referência em Assistência Social (CRAS) in each of the nine municipalities constituting the Geopark (Agudo, Dona Francisca, Faxinal do Soturno, Ivorá, Nova Palma, Pinhal Grande, Restinga Seca, São João do Polêsine, and Silveira Martins). The eBook comprises 22 articles and reports contributed by individuals who have had distinctive and valuable experiences within the territory. These narratives serve as a source of inspiration and knowledge for the present and future of our society, encompassing proponents, instructors, social workers, child caretakers, and the UFSM team

A DISCUSSION ON THE CONSTRUCTION AND MANAGEMENT OF GEOLOGICAL PARK CONSERVATION AREAS

Yang Sen, *Wangwushan-Daimeishan Global Geopark*

Currently, the construction and development of geological park conservation areas have received extensive attention from the general public. This article conducts research on the management and construction of geological park conservation areas, analyzes the relationship between the construction and management of conservation areas, and clarifies the development direction of geological park conservation areas in the future stage, providing theoretical references for professionals in the same field.

AEKN, THE FIRST ECOTOURISM COMMUNITY ASSOCIATION IN LAOS: AN EXAMPLE OF SUSTAINABLE WORK WITH LOCAL COMMUNITIES IN AN ASPIRING UNESCO GLOBAL GEOPARK

¹Khamseng Sengthongnalin, ¹Kongmany Kommalien, ²Jean-Yves Paille, ³Raphaël Torquebiau), ⁴Nicolas Klee and ⁵ Raphaël Trouiller

1. *Hin BounaUGGp*
2. *Saly Thongsavanh (AEKN)*
3. *The UNESCO Chauvet-Pont d'Arc cave*
4. *Monts d'Ardèche UNESCO Global Geopark)*
5. *Tétraktys*

Born in 2014, with the assistance of the French Cooperation Agency (AFD) and Tétraktys (French NGO specialized in territorial development, in Laos since 2009), the AEKN is the first ecotourism community association that manages a major tourism site in central Laos: the cave of Konglor-Natane which can be crossed by boat along the HinBoun River to connect the valleys of Konglor&Natane, in the heart of a breathtaking karstic area: the Phou Hin Phoun.

The management model of the AEKN allows a better distribution of the income generated by the visit of the cave and its vicinity with the villagers gathered in groups of activities. To develop this community model and reduce the impact and encroachment on the natural environment, villagers provide various services such as handicrafts, guided tours, electric boat transport, mountain bike tours, food, and homestay.

In addition, the AEKN, together with the villagers and the authorities, has promoted and protected different tourism sites within the two valleys to offer an experience and a complete destination to visitors and has also encouraged the establishment of community micro-projects, by supporting the creation of a signature menu based on local agricultural production.

Natural and cultural heritages are at the heart of this program as a vector of sustainable development, improvement of living conditions, social ties, and territorial governance for communities. The tourism activity must allow direct benefits for villagers (guiding, accommodation, catering, market gardening, crafts, etc.) and indirect (waste management, access to water and sanitation, etc.) while preserving the environment.

The more the territory manages to control the impact of its tourism development, the more the destination will be attractive and sustainable. Finally, following the latest directives from the Government of Laos, the project is in line with the stated desire of the country to promote ecotourism in its rural and natural areas as tools of income improvement for local communities. All combined these actions are definitively the basis to initiate an international recognition of this work by setting up the first geopark in Laos: The Hin BounaUGGP.

SHARING OF EXPERIENCES AND COOPERATION BETWEEN HIN BOUN AUGGP IN LAOS AND MONTS D'ARDÈCHE UNESCO GLOBAL GEOPARK IN FRANCE

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5. *Tétraktys*

The Hin Boun Aspiring UNESCO Global Geopark is made up of very varied landscapes including deep valleys, canyons, plateaus, and caves. Partly inaccessible, the area appears above all as a natural fortress preserving a rich biodiversity where communities members still make part of their living from natural resources. Depicted through parietal art, this land has also been known by humans since prehistoric times with a very strong historical and spiritual relationship between these exceptional karst reliefs and communities.

Despite different climates, the Ardèche region in France has several natural and cultural similarities. The local authorities - made up of representatives from the Chauvet cave inscribed on the UNESCO World Heritage list in 2014 and the Monts d'Ardèche Géoparc - and the Province of Khammouane sign a commitment based on experiences and knowledge sharing on natural heritage protection management and sustainable touristic development, with the purpose to support, protect and foster the creation of the first Laotian UNESCO Global Geopark in Khammouane, a region located in central Laos.

This oral presentation will introduce the history of this political cooperation and technical support which has been running since 2009. This collaboration brought many successes, in particular by laying the foundations for responsible tourism, by helping to create the first ecotourism community association in Laos, by gaining international recognition of the area and by opening up exceptional natural sites to the public.

These successes led the Lao French partners to imagine an even more ambitious project to reinforce and highlight their common efforts, with the objective of submitting their first UNESCO Geopark application in Laos.

CHEONGSONG GEOPARK EDUCATION PROGRAM FOR THE POPULARIZATION OF GEOPARK

Seong Joo

Cheongsong Geopark, located in East Asia, was designated as a Global Geopark in 2017. Cheongsong has various geological features including tuff rock mountain, Mesozoic sedimentary rocks, dinosaur footprints, and Cheongsong Spherulitic Rhyolite (FlowerStone).

CheongsongGeopark developed and operated geopark education programs for local students such as local children's centers, schools, and kindergartens under the name of Dreaming with CheongsongGeopark during the COVID-19 pandemic. The purpose of the program is geopark to learn easy and fun. Students were able to easily learn the geological features of the geopark where they live through various experiences such as volcanic eruption created Mt. Juwang, excavating dinosaur fossils using coffee waste, and landslide education.

From 2023, when COVID-19 eased, the target was expanded from children to seniors (e.g., senior citizens' colleges and senior citizen centers). In addition, textbooks were developed in cooperation with local school teachers, and geoparks were included in the regular curriculum, allowing many students to learn about geoparks. In addition, a tourist program has been developed to operate a program so that the general public can easily access and learn about geopark.



GEPARK AS A PARTICIPATORY COLLABORATIVE MANAGEMENT CONCEPT TO MANAGE THE RAJA AMPAT ARCHIPELAGO

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Numerous and multi-level organizations from sub-national to international working in Raja Ampat Regency as the globally important marine areas and world's class tourism, yet the gap of knowledge and capacities with communities keeps distancing. Raja Ampat Geopark exists as a management agency that coordinates various programs implemented by multi-institutions with various interests within the Regency. Approaching the effective management, Raja Ampat Geopark performs through three stages: 1) mapping relevant stakeholders; 2) designing a participatory collaboration strategy; and 3) encouraging the collaborative works following the strategy where the roles of each stakeholder are clear. Master plan of Raja Ampat Geopark were developed and agreed by 41 related partners of were clustered into 8 interest groups, who are implementing 31 programs consists of 84 activities. This collaborative participatory marine management resulting an increase of documentation and published biodiversity data, of which empowered by the improved-capacities of local government and communities in Raja Ampat.

GEOHERITAGE AND GEOCONSERVATION METHODS IN TABAS UNESCO GLOBAL GEOPARK, IRAN

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Tabas UNESCO Global Geopark with an area of 22,771 km² was joined to the UNESCO Global Geoparks network as the third global geopark of Iran in 2023. This geopark is located in a desert area with a hot and dry climate and is known as the geological paradise of Iran. The geological diversity of this region of Iran in West Asia is very unique due to the presence of the most complete Paleozoic sedimentary successions and the evolution of the earth from the Precambrian to Quaternary can be seen in it. Although most of the region is desert, but there are several mountain ranges in it. Currently, Tabas UNESCO Global Geopark has 39 geosites and includes all paleontological, sedimentary, tectonic, geomorphological, igneous, geohazards, natural, cultural and historical phenomena. Considering the large area of this geopark and the scattering of geological heritage sites, as well as with the aim of promoting sustainable development in the territory of Tabas UNESCO Global Geopark through valuing its heritage, conservation is considered an essential part and it is very important. Therefore, in this context, a study and list of all existing heritage (geological and non-geological) throughout the territory of the Geopark was carried out and were evaluated. Approximately 9% of the territory of this geopark is classified as a protected area, But the implementation of a comprehensive approach that brings together geodiversity, biodiversity and landscape management, recognizing its benefits to society and conserving the heritage of the geopark territory for future generations, it will be one of the main topics of the coming decades. Therefore, Tabas UNESCO Global Geopark initially defined a geoconservation strategy according to the existing conditions, which provided the possibility of monitoring, valuing and integrating different geosites and assessing their vulnerability to natural and human processes. This method for monitoring and management developed by Tabas UNESCO Global Geopark, considering that it is one of the newest geoparks of the Global Geoparks network in 2023, is based on several geoconservation programs as follows :

- 1- Inquiry of government offices from Tabas UNESCO Global Geopark for national land transfer.
- 2- National registration of geoheritage in the list of Iran's national heritage.
- 3- Transferring the geoconservation of geosites to local communities (rural governance and councils, private sector).
- 4- Memorandum with government offices. In addition, innovative methods and having new and interesting programs to promote geosciences, social programs such as meetings and talks aimed at improving communication with local community and sharing the messages of conservation the heritage of the geopark territory, training workshops on geoparks and geoconservation, mountaineering and ..., it will continue to be one of the main tasks of developing Tabas UNESCO Global Geopark to conservation the geoheritage in the future years.

**LIVING WITH ACTIVE VOLCANOES :
DISASTER PREVENTION OF SAKURAJIMA-KINKOWAN GEOPARK**

Hikari Shiba, *Sakurajima-Kinkowan Geopark, Japan*

Sakurajima-Kinkowan Geopark is a nationally recognized geopark situated in the southern region of Kyushu Island in Japan. Spanning across three cities, the geopark encompasses the prominent features of the active volcano Sakurajima and Kinkowan Bay, a picturesque inlet formed through volcanic activity.

A distinctive aspect of Sakurajima-Kinkowan Geopark is its unique relationship with an active volcano, where over 600,000 residents live in close proximity to the daily eruptions of the volcano. With an average annual eruption frequency of 200 times, the local population has learned to coexist with the volcanic activity. Despite the ongoing eruptions, the residents find solace in the captivating landscapes, delectable cuisine, and rejuvenating hot springs that the active volcano provides. These aspects also draw numerous tourists to the region, further showcasing the allure of the volcanic environment.

The geopark's commitment to disaster prevention is commendable, considering the volcano's constant activity. State-of-the-art observation facilities and disaster management strategies have garnered international attention from governments and scientists alike. This comprehensive approach ensures the safety and preparedness of the local communities.

As January 2024 marks the 110th anniversary of the major Taisho eruption, Sakurajima-Kinkowan Geopark, along with affiliated organizations, is embarking on new disaster prevention initiatives. These include creative endeavors such as "evacuation shelter art" and an immersive "disaster prevention experience tour." These projects are designed to not only educate residents and tourists about potential disasters but also emphasize the critical importance of disaster preparedness.

The geopark's continuous efforts to foster awareness, preparedness, and appreciation of the volcanic landscape underscore the resilience and unity of the community living in the shadow of Sakurajima.

USING GEOMOJIS TO COMMUNICATE GEOSCIENCE IN UNESCO GLOBAL GEOPARKS

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Communicating geosciences across linguistic and cultural borders is vital in today's world, where different people from different origins mix and interact. In the context of science education and communication, we are working on a clear and simplified pictographic system of the geological environment around us that can improve communication. These geological pictograms, or geomojis, can be used in the Global Geopark Network, and could form a global set of geoheritage symbols. In this project, we focus on the geological environment and geohazards, and much of the work is done within a UNESCO Geoscience Programme project (No 692) 'Geoheritage for Resilience', using geoheritage sites for communication and testing, and more recently with a Franco-Mexican ECOS exchange project 'Building Sense in Natural Heritage'. Our geomojis, bridge the gap between simple symbols and words, crossing language borders by representing concepts that we have identified as particularly important for understanding the geological environment around us. Our geomojis are also linked to the Global Framework for Geology (see Global and Planetary Change, 2018 – <https://digitalcommons.mtu.edu/michigantech-p/427>), allowing the context of each geomoji in the Earth system to be understood.

We are currently running international workshops to promote discussion and test the geomojis that we have created, and have done so in The Mixteca Alta Global Geopark, Mexico, and The Ometepe Geopark project, Nicaragua. These workshops have raised new pictographic needs and the problems associated with them. The goal of these workshops is to consolidate geoscience knowledge from different specialisations and create a basic standardised set of symbols for all geological environments. The global framework and the geomojis help us to think outside the box of our specialist environment. These geomoji pictograms can be used for geoscience communication in all forms, from signage at geological sites and geoparks to hazard and risk publications and in discussions with local populations. They can be adapted and modified for the local context and needs, while providing a central, and global, base for comparison. To this end we present examples prepared for the Rio Coco UNESCO Global Geopark, and various other sites.

CLIMATE CHANGE AND NATURAL HAZARDS IN KATLA UNESCO GLOBAL GEOPARK IN ICELAND

Mr. Sigurður Sigursveinsson, Katla Uggp

In the presentation an overview will be given of the general geology of Iceland focussing on its location on the Mid Atlantic Ocean Ridge, the main tectonic movements and the location of one of the world's mantle plumes (hot spots) underneath Vatnajökull Ice Cap, partly within the Katla UNESCO Global Geopark.

Attention will be paid several major eruptions during the settlement of Iceland including Eldgjá (939), Öræfajökull (1362) and Laki (1783), but also the more regular volcanic activity.

Jökulhlaup (Catastrophic Glacial outburst) are characteristic of volcanoes in Katla UGGp as many of them are covered with icecaps and when the hot lava comes into contact with the ice a lot of melting takes place as well as explosive activity forming huge ash clouds. The size of the bigger jökulhlaups can be demonstrated by the fact that in the Katla eruption of 1918 the coastline was extended several kilometers into the Atlantic ocean.

Global warming is believed to have an effect on volcanic activity in the coming years. This is inferred from the huge volcanic activity in Iceland in the millenniums following the retreat of the Ice Age glacier and the subsequent uplift of the land. The shrinking of present day glaciers is believed to have a similar effect, albeit on a much smaller scale. We are, therefore, expecting an increase in volcanic activity, and the most active volcanic part of the country is within Katla UGGp and neighbouring areas.

Present day glaciers in Iceland include both bigger ice caps but also outlet glaciers. The outlet glaciers have been found to be extremely sensitive to global warming. This is characterised both by rapid retreat but also thinning. This has caused increased danger of rock fall from unstable mountain slope when the support of the outlet glaciers diminishes.

In the presentation this development will be portrayed with the help of diagrams and photos.

THE IMPLEMENTATION PROCESS OF A PROTECTED AREA THROUGH THE COORDINATION OF AN ASPIRING UNESCO GLOBAL GEOPARK

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The Oeste aspiring Geopark (OAG) is located north of Lisbon (Portugal), in an area covering the municipalities of Cadaval, Caldas da Rainha, Bombarral, Lourinhã, Peniche and Torres Vedras. With a total of 1,154 km², the OAG has 72 kilometers of Atlantic coastline and around 213,000 inhabitants.

In 2021, the Intermunicipal Community of Oeste, composed of 12 municipalities, delegated the responsibility of coordinating the management of the Planalto das Cesaredas Strategic Plan to the OAG. The Planalto das Cesaredas (Cesaredas Plateau) is a limestone massif, managed by 4 different municipalities, dozens villages and towns scattered in about 14km². It has a rich natural heritage, with more than 1,500 different fauna and flora species observed on a regular basis, making this a unique place for nature tourism activities. On the other hand, human occupation dates back to the neolithic age, transforming this place into a territory of stories and legends that still enrich the local material and immaterial cultural heritage of many villages, turning it into a tourist product in itself. The Planalto das Cesaredas territory is also important in the history of the geological (mainly salt tectonics and marine fossils) and archaeological studies in Portugal.

Considering that the creation of a protected area is one of the main goals of the civil society and the main actors of this territory, the OAG, as a recognized entity in the territory, sought funding for the development of scientific studies that could justify the implementation of such a protected area. Funding was obtained from private companies and municipalities, and a multidisciplinary team was created to implement the necessary studies and compile a scientific dossier of the area. Based on this data, a possible new protected area within the territory of the OAG will be created.

This process is based on 3 essential factors for its success, namely: 1. Bottom up - This process was born from a Strategic Council composed of more than 20 local entities that develop direct and indirect activity in the territory of the Planalto das Cesaredas, among environmental defense associations, local development associations, parish councils, municipalities and local companies; 2. Specialists from different national universities were hired, with experience in work of this type, allowing to join the academy to the intrinsic knowledge of the territory, but above all to the service of civil society; 3. The OAG is an entity recognized by the organizations that make up the Planalto das Cesaredas' Strategic Council, but also by the set of municipalities that make up the territory of this plateau, allowing it to establish a relationship of trust, important for the creation of a future protected area, but above all as a way to ensure the essential political and financial support for the implementation of a project of this magnitude.

SUSTAINABLE DEVELOPMENT GOALS IN THE AGENDA OF THE OESTE ASPIRING GEOPARK (PORTUGAL)

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A territory that aspires to be recognized by the International Geosciences and Geoparks Programme (IGGP) of UNESCO, must comply with the guidelines that are duly approved, but must also open horizons towards the strategic planning and implementation levels of its plan of activities, to create strong links with the Sustainable Development Goals (SDGs) of the the 2030 Agenda for Sustainable Development and their respective targets. The Oeste aspiring Geopark (OAG) has had the concern since the beginning of its inception to develop its actions in the framework of the 17 SDGs.. An example of this procedure is its 'Strategic Plan', where it is possible to make a correlation between the areas and axes to be developed, in the next five years, with the 17 SDGs, directly or indirectly.

Thus, this connection will be developed in four stages. The first stage will be based in a survey regarding the SDGs and their metrics. This stage will be developed by the OesteUGGp technical team and experts in this field. In a second stage, the main activities, and initiatives to be developed in the territory will be developed through a participatory process, which are aligned with the UGGps guidelines and also with the SDGs targets. At this stage the business, associative and academic partners of the OesteUGGp will be the main participants, but also including the active agents of the local communities.

On the third stage, the 'Strategic Plan' activities will be developed through a a network methodology with the SDGs, thus understanding in what way each activity contributes to the achievement of the 2030 Agenda and its 17 SDGs (Silva, 2021), including its contribution weight for each of the goals. This process will be developed by the OesteUGGp technical team in collaboration with academic experts.

The fourth and last stage will be focused in two main pillars; i) communication; and ii) dissemination. These two pillars will be crucial for the promotion of the OAG, as an entity that works towards the achievement of the SDGs. Particular emphasis will also be given, through this process, among the local communities, and visitors, but also among economic, political and social agents that the aUGGp Association involves, stressing the importance of the actions developed in the framework of the 17 SDGs, directly or indirectly.

In recent years, the OAG has developed efforts, to correlate initiatives to all the 17 SDGs, in a balanced way. However, due to their targets and indicators, this aUGGp understands that it will not be possible to include all these different in all the developed initiatives, and projects. Therefore, from the comparative study work already done, it was concluded that around 50% of the developed initiatives have been making the link to the following SDGs: SDG 4 - "Quality Education", SDG 13 - "Climate Action", 'SDG - 14 "Life Below Water", SDG 15 "Life on Land", and SDG - 17 "Partnership for Goals".

PEOPLE, TANGIBLE AND INTANGIBLE CULTURAL HERITAGES LINK WITHIN THE KHORATUGGP, THAILAND FOR SUSTAINABLE DEVELOPMENT

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Khorat UNESCO Global Geopark has been developed since 2015 by the Nakhon Ratchasima Rajabhat University, Nakhon Ratchasima Provincial Office, and the Department of Mineral Resources, etc. It aims to be the real geopark and become the UNESCO Global Geopark. Therefore, it was carefully defining the territory under the supervision of GGN Experts, including geological, cultural, and natural site inventory. It has been developed based on Global Geopark fundamentals by the local community involvement and engagement. Khorat geopark started from "People" who would like to protect and conserve the geological heritage and fossils of Khorat. They strongly believe that research and knowledge transfer via education activities will enhance geological heritage conservation and protection of its territorial heritage and culturally and environmentally sustainable development of the area.

KhoratUGGp locates in Northeastern Thailand within Nakhon Ratchasima Province. It is 265 km Northeast of Bangkok. The geopark's total area is 3,167.38 km², covering five districts along the Lam Takhong River. The population is approximately 740,000 people. It is comprised mainly of Thai Khorat, Thai Northeastern (Isan), Thai Yaun, and Thai Chinese groups. Agriculture (rice, cassava, and sugar cane) and animal husbandry are major economic activities. The climate is Tropical Wet and Dry. The natural vegetation is mostly dry dipterocarp forest and dry evergreen forest. There are three topographical regions: a mountain area with cuestas, undulating plains, and flat plains from West to East. The highest and lowest points are approximately 782 and 163 meters above sea level. As part of the Khorat Plateau, the Geopark is underlined by Mesozoic rocks, consisting of sandstone, conglomerate, siltstone, shale, claystone, and rock salt. It has a high diversity of fossil mammals, especially elephants, and abundant and diverse petrified wood.

KhoratUGGp's not only promotes and raises awareness on geological conservation and protection but also promotes the links between geological heritage to tangible and intangible cultural heritages of the territory. Local communities are familiar with geological materials and utilization. Geological materials have been used as construction materials and crafted according to their religion, beliefs, and lifestyle such as stone sanctuaries, statues, and other important structures. Some geological material such as salt was well-known as "White Gold" which made this area part of the commercial route from Khmer to Siam in the past thousand years ago. Our ancestors used salt as medical materials, seasoning, and exchange in commerce. Traditional knowledge of salt production for medicine nearly disappeared according to technological disruption. As well as traditional knowledge and guidance in selecting and obtaining plant materials of therapeutic interest which were nearly lost are compiled and transmitted from monks and spiritual leaders to students and young ages and communities parallel with scientific knowledge. All tangible and intangible cultural heritages in Geopark are linked via people in the territory.

Keyword: KhoratUGGp, tangible heritage, intangible heritage

**APPLYING THE HISTORICAL AND CULTURAL HERITAGE OF THE UNESCO GLOBAL GEOPARK
YANGAN-TAU TO TOURISM DEVELOPMENT.**

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Yangan-Tau Geopark started its mission in 2017, and since 2020 it has been the only representative of the UGGp in the countries of the former USSR. One of the priority tasks of the geopark is the activity on preservation and popularization of historical and cultural heritage of indigenous peoples of the region, as well as tourism development.

The combination of techniques and methods used by the Geopark over the years has increased the tourist flow to the depressed area by a factor of about five. The population, appreciating the opportunities offered by the geopark movement, has become more proactive in preserving historical and cultural heritage.

Several "zones of attraction" have stood out, where historical and cultural heritage is the main tourist product. One of the main features of this area of the geopark's activity is local multiculturalism, which has centuries-old historical roots. The territory of the geopark is inhabited by representatives of the triad of nationalities classic for Bashkortostan: Bashkirs, Tatars and Russians, as well as other people's characteristic of the Volga-Ural region. Each of them has its own traditions, customs and folklore. This allows generating amazing and diverse products for tourists, both local and foreign.

Despite certain successes, it is worth noting that globalization has made significant adjustments. The Geopark faces the difficult task of balancing harmonization with the preservation of cultural diversity.

The geopark has the potential to become the centre of ethno-tourism in the region due to the richness and concentration of historical and cultural heritage. For example, the district is the birthplace of SalavatYulaev, the national hero of the Bashkir people, whose name is a recognizable brand for regional tourists, attracting patriots and history buffs. Also, great attention is paid to the archaeological heritage of the geopark, which allows researchers to reconstruct the material culture of the ancient inhabitants of the Southern Urals.

Thus, the economically underdeveloped, urbanized area has received a strong stimulus for the development of tourism and related services. The favorable location, unique natural and geological sites, aesthetically attractive landscapes, as well as rich historical and cultural heritage contribute to rapid development. Gradual work is underway to improve infrastructure and logistics.

APPLYING ARCHITECTURE IN THE SIGNAGE OF GLOBAL GEOPARKS

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Chelmos-Vouraikos UGGp and Kefalonia-Ithaca UGGp under the management of Natural Environment and Climate Change Agency (NECCA), have tried to improve the infrastructure of its visibility, providing new (A) geopark gateway signs, (B) geosites interpretation signs, and (C) geosites directional signs. The objectives of the new signage family are the enhancement of the substance and the recognizability of the Geopark, the awareness of visitors and local community, the encouragement of visiting and exploring the Geopark and the increasement of visitors attendance.

In order to achieve the above objectives, architecture principles were applied to the signage design family. The main architectural approach is the innovative and minimal design, the integration into the landscape, and at the same time the visibility in variable weather conditions. The materials that were selected for the construction of the new signs are rusty steel frame fixed on a cast concrete groundwork base, where earth colors prevail and match well with the landscape. The scientific information about the geology of the geosites and their respective biodiversity was kept as simple as possible accompanied by simplified images that would help the average visitor to digest and understand the respective geosite.

The appropriate signage of the Geopark's area and the important role of the signage as an identity creator has been always a priority for the Management Body of the Geoparks as it has been proved by its inclusion to the Action and Strategy Plan.

THE SACRO MONTE OF VARALLO (UNESCO WHL AND SESIAVAL GRANDE UGGP): WHEN ART AND GEOLOGY MERGE TOGETHER

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The Sacro Monte of Varallo (Varallo, Vercelli province, NW Italy) is one of the Sacri Monti (plural of Sacro Monte, Italian for "Sacred Mountain") of Piedmont and Lombardy (UNESCO WH sites) which are historical calvaries created in northern Italy since the 16th century. It is located in the Sesia Val Grande UNESCO Global Geopark, on a butress of rock above the town of Varallo (600 m a.s.l.) and it is the oldest and the most important Sacro Monte of the alpine region. Its story begins at the end of the XV century, when the Franciscan friar Bernardino Caimi di Milano, on his return of the Holy Land, decided to reproduce the holy places of Palestine in Valsesia. The Sacro Monte of Varallo includes a basilica and forty-five frescoed chapels populated by over eight hundred statues. Connected by the steepest cableway in Europe, the site overlooks the historical centre of Varallo with its sumptuous monuments: the Picture-Gallery, the Museum of Natural Science and the Church of Santa Maria delle Grazie, painted by Gaudenzio Ferrari (1513). The Sacro Monte of Varallo is the most important of the pre-alpine Sacro Monte both for its artistic and historical significance and for its naturalistic make up, rich in autochthonous and exotic plants arranged following the patterns of the Italian Renaissance gardens which aimed at emphasizing the nearby architectural structures. Although the territory has been profoundly altered by man, after years of gradual abandonment, the forest covering has slowly been returning floral elements that have developed and today accounts more than 421 species. Inside the sacred area, the natural environment has been strongly shaped by man to resemble the typical gardens of Renaissance Italy. The area characterized by a surface of 22 hectares, an elevation between 455 and 650 m a.s.l. in environment of mountain, features an "organ-pipe" wood of beech trees and some individual, centuries old trees of various species. The Sacro Monte di Varallo is a protected area of Regione Piemonte from 1980 and since 2012 it has been part of the Ente di Gestione dei Sacri Monti and "Sacri Monti UNESCO World Heritage Site". During the fieldtrip at Sacro Monte di Varallo in occasion of the 16th European Geoparks conference at Verbania (VCO province, NW Italy), an idea to enhance also the geological contents of Sacri Monti was born, in order to evaluate the importance of this geological heritage site.

The Sacro Monte di Varallo is located where the Canavese segment of the Insubric Line (a 1-km-thick mylonite belt that is a major tectonic boundary in the Alps) crops out. North and west of the Insubric Line, the Austroalpine Domain consists of piles of nappes, which were assembled and affected by a metamorphic overprint reaching eclogite facies during the Alpine orogeny. South and east of the Insubric Line, rocks of the Southalpine Domain were not affected by this metamorphic event and preserve an older history despite experiencing substantial Alpine tectonic deformation. These rocks originally belonged to the northern margin of the Adriatic plate, and within them an exceptional record of metamorphic and igneous events are preserved within a virtually intact section through the pre-Alpine crust that is the focus of the Geopark. Visitors can walk on fragments of sub-continental mantle, they can visit the contact between a massive gabbro intrusion and the rocks of the deep crust to see how they interact to generate granitic magma, they can also visit the roots and the roof of a granitic pluton and admire the chaotic breccias produced by explosive super eruption that formed a caldera at least 15-km in diameter. Thrust-sheets of rocks that were stacked to form the Alps during the collision between Europe and Africa are wonderfully displayed along the lower Valsesia Valley in particular in Varallo. To the northwest of the Canavese Line, the public can visit outcrops of high-pressure metamorphic rocks and fragments of the Tethys oceanic crust that once separated Europe and Africa. Some of this important rocks were used as ornamental stones used for the construction and decoration of the chapels and the Basilica of the Sacro Monte di Varallo. The work presents an overview of the main ornamental stones used at Sacro Monte in order to evaluate and enhance in historical-cultural contest. The study and analysis of stone materials in a historical-cultural context is therefore of fundamental importance for the enhancement of the territory, since the geological heritage is evidence of its history and material culture.

Key words: Varallo, UNESCO, Geopark, geology, ornamental stones

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NATURE CONSERVATION ACTIVITIES IN KRAS – CARSO, ASPIRING CROSS-BORDER GEOPARK SLOVENIA AND ITALY

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The area of the aspiring geopark Kras Carso encompasses the Classical Karst, a karst plateau shared between Italy and Slovenia. The Classical Karst area has extremely high nature significance. The area is a part of Dinaric Karst, predominantly composed of Cretaceous and Palaeogene carbonate rocks. The sedimentary succession, covering a timespan of nearly 100 million years from the beginning of the Cretaceous period, about 140 million years ago (mya), to the middle of Eocene period about 45 mya. Karst geomorphology is characterized by all kinds of superficial (small and wide) and underground phenomena, the latter reflect the activity of the River Reka/Timavo hydrogeological system. The area is very rich on fossil inventory of several faunal and floral elements; one of the most complete and best-preserved dinosaurs in the world (Antonio and Bruno), found at the VillaggiodelPescatore/Ribiškonaselje and other exceptionally well-preserved fossil vertebrates found in the platy limestones in the areas of Komen and Tomaj. In different profiles in the area The Cretaceous-Paleogene (Mesozoic-Cenozoic) mass-extinction event, one of the most devastating mass-extinctions that occurred on the planet, is recorded (K-Pg horizon). The significant presence of geo-related resources of the Classical Karst is complemented by the exceptional biodiversity and the large number of rare and endemic species, that places the Karst among the areas with the highest biodiversity in Europe. A significant natural heritage is also evidenced with two Biosphere Reserves under UNESCO with the intergovernmental programme MaB – Man and Biosphere, namely the Škocjan Caves Park and the Marine Protected Area of Miramare. In the Classical Karst, the characteristics of geology and exceptional biodiversity are reflected in the landscape, way of life and rich cultural heritage.

The first initiatives to establish a geopark on the Classical Karst area dated more than 10 years ago. The activities were carried out with various projects from European programs, unfortunately, the management structure of the geopark has not yet been finalized. However, in the new ongoing strategic project KRAS CARSO II, both Slovenian and Italian partners work under the title “Joint management and sustainable development of the Classical Karst area”. The KRAS CARSO II project includes, in addition to the before mentioned objectives, also very important nature conservation activities. Within the framework of nature conservation, it will work primarily with the aim of directing the protection and preservation of the geodiversity and biodiversity of the Karst. The focus will be on the preparation of data on the carrying capacity of the nature of the selected areas (geological heritage, caves, etc.) and the preparation of guidelines and mitigation measures for visiting, management and sustainable use of natural values, protected areas, and Natura 2000 areas in the project area. The IRSNC will also monitor the state of selected natural values and prepare possible measures in the design of activities and tourist products.

INTERPRETATION SYSTEM OF LONGYAN ASPIRING GLOBAL GEOPARK, FUJIAN PROVINCE, CHINA

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Longyan Aspiring Global Geopark is located in Longyan City, western part of Fujian Province, China. After several years of construction, Longyan Geopark has established a relatively complete interpretation system.

From the perspective of interpretation system types, including museums, visitor centers, information kiosks, information panels and so on.

There are 5 museums.

Longyan Geopark Museum is located in Liancheng County, Longyan City. It comprehensively introduces the general situation of Longyan Geopark as well as the basic knowledge of geoscience and related knowledge of geopark.

The Liancheng County Museum is also located in Liancheng County, Longyan City, and mainly displays the history and culture of Liancheng County.

Zijin Museum of Geology and Mineral Resources mainly introduces the basic knowledge of geoscience and mineral resources.

The South China Tiger Museum is located in Gutian Town, Shanghang County, Longyan City, and mainly introduces the knowledge of tigers and the biodiversity of Meihuashan Mountain.

Longyan Forestry Science and Education Hall is located in Baisha Town, Shanghang County, Longyan City. It has the functions of forestry science and technology exhibition, forestry science education and forestry culture education.

There are 7 visitor centers, which are Guanzhai Mountain Visitor Center, Meihuashan Visitor Center, Zijinshan Tourist Reception Center, Peitian Visitor Center, Gutian Visitor Center, Caixi Visitor Center and Zhuguan Visitor Center.

A total of 80 kiosks or information stations were located in Guanzhaishan, Meihuashan, Zijinshan and Huanglianyu as well as some partners of Longyan Geopark.

There are 4 main monuments in the geopark, located at Guanzhaishan, Meihuashan, Zijinshan and Huanglianyu. 7 boundary tablets, evenly distributed in Shanghang County, Liancheng County and Xinluo District.

Geoparks information board, including the original interpretation system, such as landscape interpretation board, traffic guidance sign, management sign, service sign, etc., as well as the newly established 16 comprehensive interpretation boards, 35 landscape interpretation boards, 9 rural road traffic guidance signs, 40 management signs (prompt note, warning note).

Electronic navigation system of Longyan Geopark, including the English and Chinese voice interpretation of the relics. By obtaining mobile phone location, you can query the distance of scenic spots. Click on the name of the site to view text, voice commentary, local weather, and navigate to the relevant sites.

The spatial distribution of the interpretation system can be summarized as point-line-plane.

Points, means the point distribution of museums, visitor centers, information stations, information boards, etc.

Line refers to popular science education, scientific investigation, outdoor hiking and other trails. Among them, the popular science education trails include Meihuashan geology popular science route, wildlife popular science route, birds popular science route, Chinese Yew Garden rare plants popular science route, Danxia landscape popular science route, karst landscape popular science route, granite landscape popular science route. Scientific investigation routes include volcanic rocks investigation routes, world-class super large copper-gold deposit geological investigation routes, clastic rock geomorphology geological investigation routes. Outdoor hiking routes are concentrated in the Huanglianyu area. Other routes include Guanzhaishan bike ride route, Jiulonghu Lake and Shimenhu Lake cruise routes, cultural heritage route, intangible cultural heritage route, etc.

Plane refers to Geopark guide map and electronic guide system, which can comprehensively understand the scope of Longyan Geopark as a whole, and the distribution of geological, natural, cultural and intangible cultural heritage site.

IMPLEMENTATION OF TATA ASPIRING UNESCO GLOBAL GEOPARK (SOUTH MOROCCO)

Boujemaa Tadoummant, *President of Tata Geopark Association*

Tata Geopark project is a territory located in Morocco, which is located in the North-West of the African continent. It is located in southern Morocco, in the region of Souss-Massa, in the province of Tata, constituting part of the Western Anti-Atlas. It is limited to the North-West by the two other circles of the province of Tata (circle of Tata and circle of Fougued) and the region of Draa-Tafilalt, to the East by Algeria, to the South and South-West by the region of Guelmim-Oued Noun and to the West by the province of Tiznit. It is a region characterized by an oasis environment with a semi-arid climate and a mainly rural character.

The territory of the geopark covers 1/3 of the province of Tata, in other words, the administrative limits of the circle of Akka. It includes 6 territorial municipalities, from the South-West to the North-East consisting of: Fam El Hisn; Tamanart; Ait Ouabelli; Tizounine; Kasbat Sidi Abdallah Ben Mbark and Akka. The area is approximately 7635 Km² with a population of approximately 30,237 inhabitants. For clarification, this project is a provincial project, the first phase will be devoted to the circle of Akka, then a request for extension of the geopark will be sent in order to expand and cover the entire province of Tata.

The territory of the future Tata Geopark is characterized by peculiarities of natural and cultural heritage resources. The types of this heritage which can be geological and geomorphological (geosites and potential geomorphosites); ecological and biological (animal and plant species), rock (rock engravings and paintings); architectural (attics, mosques, watchtowers, etc.); archaeological; ethnographic and intangible (dances or songs, etc.). This diversified heritage can serve as a roadmap for local authorities to develop an interesting activity in the tourist sector.

The creation and operation of the Tata Geopark is a very important component in the tourism industry, a real synergy for the creation of small and medium-sized enterprises for the benefit of local populations, who are invited to invest more in this sector. The Tata Geopark Association is the holder of this project, created in 2022, representing its management committee. The geopark is run in a project logic mobilizing cross-skills within a multidisciplinary team. A steering committee will guide the management committee, which will be supported by a scientific committee. The latter brings together specialists from various academic and professional institutions, whose main role is to oversee the scientific aspect of the Geopark. In addition, a technical committee will be responsible for the implementation of actions on the field. Partnership agreements will then be signed with the municipal councils, the provincial council and the regional council as well as with the services of the ministerial departments concerned.

Key words: South Morocco; Tata; geopark; geotourism; sustainable development

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PROMOTING GEOLOGICAL HERITAGE IN PÄIJÄNNE NATIONAL PARK IN SALPAUSSELKÄ UNESCO GLOBAL GEOPARK, FINLAND

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Salpausselkä UNESCO Global Geopark (UGGp) encompasses six municipalities (Lahti, Hollola, Heinola, Asikkala, Padasjoki and Sysmä) in southern Finland, only one hour by train from the capital city Helsinki. The outstanding glaciofluvial ridges and rocky outcrops, surrounded by plentiful water bodies, form the backbone of the picturesque landscape, which offers great potential for geotourism.

There are 41 national parks in Finland. They are extensive nature conservation areas, which not only protect the biodiversity, but also give people opportunity to relax and enjoy nature. National parks are managed by Parks & Wildlife Finland, which is a unit of Metsähallitus, the Finnish Forest Administration.

Päijänne National Park, situated in the southern Lake Päijänne within the municipalities of Padasjoki, Asikkala and Sysmä, lies entirely within the Geopark area and is one of the most valuable parts of Salpausselkä UGGp. The second deepest lake of Finland was formed into a deep and large fracture zone system of the bedrock. It separated from the Baltic Sea during the Ancylus stage about 9500 years ago. The sandy esker islands, rugged cliffs of the rocky islands and bird skerries form an entity that is unique in terms of geology, landscape and nature.

The national park was established in 1993 to protect the beautiful and valuable archipelago nature of the large lake. It includes some 50 uninhabited islands and rocky islets as well as parts of a few inhabited islands. Some of the islands are part of the nearly 2 billion years old bedrock, formed when high fold mountains rose in the area of present-day southern Finland. The esker islands formed at the end of the last Ice Age, some 11 000 years ago, when the melt water streams deposited sand and gravel at the bed and mouths of the streams. The heart of the national park is the unique, 8-km-long uninhabited esker island Kelvenne.

The Päijänne National Park is extremely important in terms of its geological value, but the geological heritage of the area has not always been so well known. During and after the establishment of Salpausselkä Geopark, the promotion of the national park's geoheritage has been improved. For example, new info panels have been installed in the national park, with both site-specific and general geopark information and interpretation. Geoheritage is promoted also on the national park website in Finnish, Swedish and English.

In June 2023, the 30th anniversary of Päijänne National Park was celebrated during the European Geoparks week. Several events open for the public were organised by Parks & Wildlife Finland and the municipalities, in cooperation with the geopark management. The events included guided boat cruises and walks in the main geological and cultural heritage sites of the national park. The sustainable promotion of the valuable heritage of the national park continues in close cooperation between the stakeholders.

Reference: www.salpausselkageopark.fi, <https://www.nationalparks.fi/>

SAHTIFARMHOUSE ALE - INTANGIBLE HERITAGE OF TWO UNESCO GLOBAL GEOPARKS IN FINLAND

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Sahti is an ancient beverage and a traditional speciality guaranteed (TSG) product from Finland. It is an unpasteurized farmhouse ale, typically home-made for festivities like weddings, midsummer and Christmas. Manufacture of sahti is a unique tradition, as it represents ancient homebrewing practices that have survived to this day. Along with sahti, a few other traditional home-made ales exist in Northern Europe.

The tradition of sahti manufacturing has been widespread in the past but has in many areas been superseded by the availability of commercial beverages. Today sahti is part of intangible heritage in two UNESCO Global Geoparks in Finland: Lauhanvuori - Hämeen kangas Geopark and Salpausselkä Geopark.

Raw materials of sahti are barley malt, other cereal malt and cereals (rye, barley, wheat and oats) and usually hops. Baker's yeast or harvested yeast is used in fermenting. Fresh groundwater is also needed, and the equipment used in brewing are traditionally sanitized using juniper infusion. Juniper is traditionally also used in the filtering process, contributing to the flavour. There is slight local variation in raw materials and brewing techniques used in sahti manufacturing.

Typical sahti is brown, non-sparkling and thick in consistency. A local speciality in Lauhanvuori - Hämeen kangas Geopark is a pale rye sahti, in which rye is the main cereal used. The usage of rye is attributed to local geography and climate, which in the past was more suited for cultivation of rye instead of barley.

Sahti brewing brings people together, excess is shared to neighbours, relatives, and friends alike. In the past sahti brewing used to be women's work but today it is mostly done by men. There are several NGOs devoted to keeping the sahti brewing skill alive. The role of the circulating national sahti brewing championship contest bringing brewers together is also important for maintaining the heritage. In Salpausselkä Geopark, the Sahti Fair has been organized for over 30 years in Padasjoki, being the most important summer event of this municipality.

Traditionally brewing takes place in barn kitchen, with a heat source and a large cauldron used for mashing and wooden vessels for filtering and fermentation. The Sahti institute in Lauhanvuori equipped with stainless steel equipment provides a modern facility for sahti brewers and is used by brewers across Finland.

Food tourism is an ever-growing trend and serving local specialities is important. It is however challenging to build a commercially viable tourism product based on local tradition in areas where the amount of tourism is low. Sahti is a true local product – this is both an opportunity and a challenge. Because of the living nature and short shelf life of sahti, there are only a few brews available commercially. Instead of a consumer product, sahti may be better suited as part of a culinary experience service. A well-established product and a speciality in Salpausselkä Geopark is the Hollolan Hirvi stone sahti, which combines ancient methods to modern facilities of brewing: the heating is done using hot stones immersed in the mash.

Key words: Brewing, Geopark, Intangible Heritage, Sahti, TSG

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**COMMUNITY-BASED TOURISM: EMPOWERING
LOCAL CHAMPIONS FOR SUSTAINABLE TOURISM
INKHON KAEN ASPIRING UNESCO GLOBAL GEOPARK**

Saengpet Tantaatipanit / Phakasawan Pratchayakup

Back to Earth (Tan Khun) Farmstay. / KhonKaen Aspiring UNESCO Global Geopark.

In 1976, the first dinosaur fossil discovery in Thailand was made in KhonKaen province, leading to excavation and research in the Phu Wiang mountain. Up until now, new species of dinosaurs have been discovered, totaling five species. In 2001, Phu Wiang Dinosaur Museum, the first dinosaur museum in Thailand has established. Tourists continuously visit to explore the museum. However, a problem arose as tourists who came to visit the museum rarely ventured to other tourist spots in the area. This resulted in a lack of income distribution from tourism to the local communities as it should be. Therefore, in 2018, the KhonKaen (a)UGGP was established to implement an integrated management approach, network building, and a bottom-up approach based on the UNESCO Global Geopark concept.

Tan Khun (Back to Earth) Farmstay is located near the Phu Wiang Dinosaur Museum. The farmstay's goal is to live a sustainable self-sufficient lifestyle, engage in business for the community, and generate income for the community through sustainable tourism. It has been part of the KhonKaen Geopark network since 2020 and has participated in training seminars on community-based tourism organized by the KhonKaen Geopark multiple times. It has joined the network in the area to organize community-based tourism activities. Over the past three years, more than 30 low-carbon tourism and learning activities have been organized, both independently and with the support of the KhonKaen Geopark. Most participating tourists are from outside the area, mainly urban residents, including families, student groups, educational excursion groups, business groups, elderly groups, and autistic children. The design of each activity focuses on distributing work and income to the community as a primary objective. Examples of activities include learning about sustainable farming practices, exploring geological sites in the area, traveling by community tricycles, participating in workshops on local crafts, visiting cultural heritage sites, joining local festivals, and enjoying locally sourced food from the farm's produce, community networks, and markets. Moreover, the farm actively encourages children in the community to participate as young tour guides and welcomes tourists to the area.

This is a model for local people who have previously migrated to urban areas for work. Upon returning, they utilize themselves as a bridge to efficiently connect tourists from urban areas to the local community.

Keywords : *Community-based tourism , Geotourism , Learning Activity Good practice , Local Champion*

CROSS-CHANNEL GEOPARK

Greg Taylor & Helene Dehouck

The authors are Project Officers for the UNESCO Sites Across the Channel (USAC) project, funded by the EU Interreg Fund. The Cross-Channel Geopark project is a partnership between the Kent Downs Area of Outstanding Natural Beauty (KDAONB) & the Parc Naturel Regional des Caps et Marais d'Opale (PNRCMO).

If successful in being awarded UNESCO Global Geopark status, the Cross-Channel Geopark will be the first transnational geopark to incorporate a marine boundary - the Channel. It will also be the first UNESCO Global Geopark to focus primarily on Chalk.

The marine element of the Geopark is not simply a boundary separating two terrestrial areas of geological importance, but a crucial element of the international geological significance of the area. This is primarily in relation to the traces of the megaflood that created the Channel that can be found on the sea-floor (the Fosses Dangeard) along with other important geological features including traces of paleo-rivers which pre-date the megaflood.

The marine extent of the Cross-Channel Geopark also features important non-geological features, none more outstanding than the Channel Tunnel, one of the modern industrial wonders of the world which owes its very creation to the study of geology, and has had huge cultural & biological implications in the years since it was first dug. In this way the 'Channel' in the Cross-Channel Geopark is not simply a boundary or a 'gap', but the continuation of a block of Chalk that is the same on one side as it is on the other.

The Chalk exposures of the White Cliffs of Dover and Cap Blanc Nez are among some of the most instantly-recognisable geological features on the planet, and examples of the impact of Chalk upon all aspects of the heritage of the Geopark can be found throughout both terrestrial areas in disused quarries, chalk grasslands, and many other sites. Other geological features focus as one would expect around the layers found in the Weald-Artois Anticline, most notably the Jurassic exposures found in the Boulogne-sur-mer region.

The Cross-Channel Geopark reunites two areas that were separated half a million years ago by a catastrophic event which ultimately led to the diverse range of human interaction and conflict which has variously connected and separated the two areas in the last several thousand years.

This project is now a year and a half old and we have made significant progress as we build towards submitting our application. In the last year we have confirmed our list of geosites on both sides of the Channel, and continue to engage with scientists and other experts about geosites in the Channel itself. We have also created a Geopark logo and brand, alongside a new Cross-Channel Geopark website, and commissioned an interpretation strategy. We have developed new activities on the ground under the Geopark banner, including an arts-led festival of the Geopark, volunteering group and educational programmes working with schools, universities and community groups. Supporting the latter we have also created several educational animations explaining different aspects of the geodiversity of our Geopark, and many educational resources on topics relating to the natural environment.

THE ASPIRING CROSS-CHANNEL GEOPARK

Greg Taylor & Helene Dehouck

The Cross-Channel Geopark has been developed through the UNESCO Sites Across the Channel (USAC) project, funded by the EU Interreg France (Channel) England programme. In the process of developing the Geopark we have created many educational resources for a general audience as part of a wider programme of educational activity engaging schools, universities and various community organisations.

Some of the main resources and activities we have created are:

- A series of animations explaining individual aspects of the geology of our Geopark, for example Chalk and Fossils. These animations are created for schoolchildren but are also useful for the general public.
- An artistic animation of the creation of Chalk and the Megaflood event that created the Strait of Dover, which runs directly through the middle of our Geopark. This animation is created for a general audience, but is still accessible for schoolchildren.
- Worksheets and lesson plans allowing teachers and others to lead sessions educating schoolchildren or other groups. These focus on a range of things, including aspects of the natural environment, creating music in nature, and writing your own manifesto based on the UN SDGs.
- A geology educational bag made available to educators which allows them to deliver geology lessons both inside or outside of the classroom.
- An exhibition about the Cross-Channel Geopark hosted initially near Cap-Blanc-Nez in France but able to be moved around, with exhibits and recordings from both sides of the Channel.
- Geology training sessions for tourism professionals to allow them to lead walks or educate their own customers on specific aspects of the Geopark.
- Volunteer working groups that have rebuilt traditional dry-stone walls in the French part of the Geopark.

An important aspect of developing effective educational resources and activities is co-production. In this context co-production refers to the collaborative development of educational resources by a group of participants which must include both an expert in the field of study and the end user or 'consumer' of the resource, for example a teacher. In this way we can ensure that resources and activities are useful to others.

Another aspect of our communication of scientific knowledge to the public has been through arts-led activities, including our SALT+EARTH Festival. By engaging with artists and encouraging them to create work in response to the geodiversity of our Geopark, the general public can be engaged in innovative ways.

THE INTERNATIONAL TRAINING PROGRAMME ON THE PROMOTION OF LEARNING FOR GLOBAL CITIZENS WITHIN 3 NATURE LEARNING SITES OF UNESCO DESIGNATED SITES

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Khorat Geopark, located in Nakhon Ratchasima Province, Thailand, does not overlap with or encompass any other UNESCO designated sites in the province. However, Khorat Geopark established a Memorandum of Understanding with the Sakaerat Biosphere Reserve and Khao Yai National Park, which is part of the UNESCO World Heritage Site, Dong Phrayayen–Khao Yai Forest Complex, in 2018. This partnership has facilitated educational activities, including the Geopark camp, benefiting teachers and students from 37 Geopark schools. In 2023, significant progress has been made in organizing new activities to create a learning model for Thailand in UNESCO designated sites within Nakhon Ratchasima Province. The Thai National Commission for UNESCO, in collaboration with the Northeastern Research Institute of Petrified Wood and Mineral Resources and Nakhon Ratchasima Rajabhat University, organized the International Training Program on the Promotion of Learning for Global Citizens within three nature learning sites designated by UNESCO. Held from March 27 to 29, 2023, the program aims to enhance environmental learning management capacity through project-based, problem-based, and phenomenon-based learning approaches. It serves as an exchange platform for teachers, educators, and staff from relevant agencies in the region, including knowledge lectures and practical visits to the three UNESCO Designated Sites.

The training program welcomed 40 participants, including teachers, academics, and staff from LangkawiUGGp (Malaysia), Dak Nong UGGp (Vietnam), Merangin JambiUGGp (Indonesia), Laos, and other aspiring Geoparks in Thailand (KhonKaen, UbonRatchathani, Kalasin). Participants gained valuable knowledge applicable in their classrooms and had the opportunity to exchange learning experiences with academics and staff responsible for managing UNESCO Designated sites. Some countries without geoparks have also studied guidelines and prepared for future activities.

The integration of sustainable development concepts with education, along with the connection to UNESCO Designated Sites and other UNESCO networks, highlights the crucial role of education in achieving the Sustainable Development Goals (SDGs), particularly Goal 4 (SDG 4). The Thai National Commission for UNESCO, plays a vital role in supporting the operations of various UNESCO networks in Thailand and strengthening educational institutions such as the UNESCO Associated Schools Network (ASPnet) in Thailand. This support is instrumental in Thailand geopark development.

Keywords: Khorat Geopark, International Training, Experience Sharing

NORGE MINERALER AS, SUSTAINABLE MINING AND CRITICAL RAW MATERIALS : ENSURING SECURE AND SUSTAINABLE SUPPLY CHAINS FOR EU'S GREEN AND DIGITAL FUTURE WITH ZERO EMISSION. SUSTAINABLE MINING IN GEOPARKS.

Pål Thjøømøe, *Sustainable Business Solutions Manager– Norge Mineraler AS*

The mining industry in Europe is implementing systems for sustainable mining. Mining companies have become or are on their way to be technological leaders. Social mining following the highest of standards secure the Social License to Operate (SLO). North of Europe, Sweden, Finland and Norway have a good potential to solve much of EUs demand.

The EU's Critical Raw Materials Act will equip the EU with the tools to ensure the EU's access to a secure and sustainable supply of critical raw materials. The Act has a list of critical raw material and a list of strategic raw materials, which are crucial to technologies important to Europe's green and digital ambitions and for defence and space applications.

The Act will reduce the administrative burden and simplify permitting procedures for critical raw materials projects in the EU and shorter permitting timeframes.

The Commission will strengthen the uptake and deployment of breakthrough technologies in critical raw materials.

The proposed Regulation will be discussed and agreed by the European Parliament and the Council of the European Union before its adoption and entry into force.

The Critical Raw Material Act is presented in parallel to the EU's Net Zero Industry Act, which aims to scale up the EU manufacture of key carbon neutral or "net-zero" technologies to ensure secure, sustainable and competitive supply chains for clean energy in view of reaching the EU's climate and energy ambitions.

Norge Mining AS is planning extraction of critical minerals as Vanadium and Phosphor. For Norway, the oil and gas industries have no doubt had a big impact on the surrounding environment. That's why NMAS approach is different; NMAS considerate, responsible, modern mining techniques – all are sensitive to the surrounding environment, ecology and communities. Some of the minerals NMAS are exploring will greatly contribute to a more sustainable global future.

Several UNESCO Global Geoparks included mining activities and the cooperation with the owners and local inhabitants, through written agreement, educational activities and public engagement is crucial for keeping the UNESCO status and providing sustainable development to the involved territories.

NMAS could become role model for sustainable mining in UNESCO Global Geoparks, thanks to the signed cooperation with Magma UGGp, we think it could also play a key role in the forthcoming International Geoscience and Geoparks Programme through the innovative developed guidelines ready to be exploited as best practice for the necessary sustainable green revolution.

THE PRESERVATION OF THE TRADITIONAL PAPER MAKING CRAFT IN DIA TREN VILLAGE IN NON NUOC CAO BANG GEOPARK

Ly Thi Thu Thuy – *officer, Management board of Non nuoc Cao Bang UNESCO global geopark, Department of Culture, Sports and Tourism, Cao Bang province, Viet Nam.*

Located in the Northeast of Vietnam, Non nuoc Cao Bang has an area of 3683 km². The Geopark is home to different ethnic groups, including Tay, Nung, Mong, Dao, Lo Lo, San Chi, etc. Non nuoc Cao Bang UNESCO Global Geopark is also a land of many tangible and intangible cultural heritage. Each ethnic group has different cultural features that create the significant features of the geopark.

Dia Tren traditional paper making craft village is situated in Phuc Sen commune, Quang Hoa district, is one of traditional craft villages in Non nuoc Cao Bang Geopark territory. This is the living area of Nung people whose culture are unique and well protected. Papermaking craft in Dia Tren hamlet has existed for a long time, The traditional paper is mainly used for the spiritual purposes of ethnic minorities. Besides, paper quality and design cannot compete with industrial paper products. The low income from paper making makes many people, especially young villagers no longer interested in this traditional craft. Actually It is in danger of being lost because of the industrialization. So Management board of Non nuoc Cao Bang geopark has been focusing on the preservation and promotion of the traditional paper making craft.

This presentation will share some of our efforts in preserving the traditional paper production in connection with their livelihood improvement of Nung ethnic group in Dia Tren village in order that it would be preserved to the future generation and transfer Dia Tren into an interesting destination for experience tourism in the geopark territory.

Key words: the presevation and promotion of the traditional paper making craft, livelihood improvement,an interesting destination

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GEOTOURISM FOR COMMUNITY ENGAGEMENT, INCLUSIVE AND EQUITABLE DEVELOPMENT

Thùy, Vi Trần- *Deputy Director, Management board of Non nuoc Cao Bang UNESCO global geopark, Department of Culture, Sports and Tourism, Cao Bang province, Viet Nam.*

Non nuoc Cao Bang, a remote frontier area located in the North of Viet Nam, was designated as a UNESCO global geopark in 2018. This designation has been assisting Cao Bang province moving towards embracing inclusive, equitable and conservation-based socio-economic development. The criteria of a UNESCO global geopark in the operational guideline have been working as an operational guideline for the protection and conservation of traditional culture, tangible and intangible heritages. Though the Geopark is located in a disadvantaged area of Viet Nam, its history has been associated with the development and independence struggle for independence of Viet Nam. Apart from historical significances, the Geopark is also well-known for its biodiversity, mineral deposits, natural landscapes, diversity in cultures of ethnic minority groups, and especially geological heritage. The UNESCO global geopark designation is a milestone and an acceleration for tourism development of Cao Bang province. The increased number of visitors has been contributing to lift up living standards of population catchment in the geopark territory. In spite of undeniable economic benefits from touristic activities in the geopark territory, the equitable and inclusive tourism growth remains a concern. Inequitable benefits from touristic activities is a growing concern, especially people in rural area where there are newly-emerged touristic activities.

The presentation will focus on examining the initiation and efforts of Non nuoc Cao Bang UGGp particularly the introduction of “community engagement” activities and conservation of embedded heritages of in Cao Bang province as a solution for the sustainable development approach to the tourism industry of Cao Bang.

Key words: Community engagement, equitable, inclusive development conservation, and livelihood improvement

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GEOPARQUE ZAQUENZIPA – ASPIRANTE UNESCO – BOYACA, COLOMBIA

Torres Peaquive Patricia

Location

The Zaquenzipa Geopark is located in the eastern range of the northern Andes in Colombia. This geopark covers four municipalities in the department of Boyacá: Chasika, Santa Sofia, Sutamarchán, and Villa de Leyva. Spanning an area of 372.48 km², it is inhabited by 33,053 residents distributed across a variety of landscapes ranging from 2,000 to 3,800 meters above sea level. These landscapes include valleys, slopes, mountains, and paramos, providing great geographical and altitudinal diversity.

Scientific Relevance and International Interest

The territory of the Zaquenzipa Geopark offers an exceptional window to explore the Lower Cretaceous period, which is recognized for recording the highest sea levels in the geological history of the planet. Here, a diverse fossil record of marine reptiles such as plesiosaurs, pliosaurs, ichthyosaurs, marine turtles, crabs, ammonites, and bivalves, among others, can be found. Discoveries in this area include new species and holotypes.

The paleontological site within the rocks of the Paja Formation presents exceptional conditions, making it a Lagerstätte of great scientific relevance and global importance. It stands out for the variety, abundance, and preservation of fossils, particularly those belonging to the order Plesiosauria. These fossils exhibit a high level of skeletal integrity and articulation, making it a place of great value for the scientific community and for understanding the history of life on our planet.

Additionally, other paleontological findings in the Geozaquenzipa territory include the discovery of fossils from more recent times (Quaternary), including mastodon bones and evidence of terrestrial organisms such as armadillos and the Smilodon tiger.

Important Facts

- The Lower Cretaceous Marine Reptile Lagerstätte of Alto Ricaurte is recognized as one of the top 100 sites of global geological heritage.
- The world's largest Pliosaur is found in the municipality of Šáchica.
- Skeletal remains of Pliosaurs and Plesiosaurs have been discovered, identifying them as new species.
- The diversity, integrity, and excellent preservation of marine species, including reptiles, turtles, Ichthyosaurs, and ammonites, are recognized.
- The geopark showcases landscapes dominated by a mosaic of natural ecosystems and transformed systems.
- The richness of the cultural heritage is derived from the indigenous Muisca culture, which inhabited the Cundiboyacense high plateau.

Cultural Heritage

The region is rich in cultural expressions, which are manifested through ancestral crafts and knowledge, daily practices, and festivals rooted in the intangible heritage of its communities. Additionally, this territory holds a valuable archaeological, architectural, and historical heritage, which also demonstrates a close relationship with the geodiversity of the surrounding area.

GEOPACA ADVENTURES IN THE "CAMINO REAL DE GUADALUPE" (ROYAL ROAD) TO THE SUSTAINABLE DEVELOPMENT GOALS.

Torrescusa Vega, J.¹; Bonilla Leo, A.¹; Cortijo, I.²

1. *CRA La Jara. Government of Extremadura, Spain.*
2. *Management team of the Villuercas-Ibores-Jara UNESCO World Geopark.*

The Geocentre CRA LA JARA, located in Villar del Pedroso, Cáceres, Spain, within the UNESCO Global Geopark Villuercas Ibores Jara presents the “Geopaca Folk Entrepreneurial Culture project featuring Gil Cordero”, resulting in an intergenerational workspace and inviting all individuals from our community who wish to participate from Early Childhood Education to the elderly residents of the area.

We have aimed to enhance the current state of our Geocentre by telling the history of our region to the entire educational community in an original way. Then, our main goals are to become acquainted with it and appreciate our land, as well as to feel proud to live in it. In this context, we hope to reduce the feeling of isolation that exists and foster a strong connection to their roots.

But what is Geopaca Folk referred to?

Geopaca Folk is a project focused on Geopaca, a goat which is the Geopark mascot. Geopaca pretends to be a symbol of unity and motivation within the entire educational community. With Geopaca as the main character, we plan to create a group that combines music, theatre, dance and visual arts, essentially creating a performance involving students, teachers, and families. The traditional regional songs have been adapted to the 21st century to narrate a part of history, such as the Camino Real de Guadalupe, which passes through our Geopark.

Furthermore, we have gone for inclusivity by promoting the participation of intergenerational groups and working collaboratively and closely with the other two educational centres involved in the project: C.E.E. PROA and I.E.S "El Brocense" in Cáceres city. Due to this collaboration, they have known our Geopark at the same time we have fostered an inclusive environment by actively involving PROA, the Special Education Centre.

Within the project, we have worked on the Sustainable Development Goals, which represent an important guide for international, national, local social and economic strategies since the United Nations delegates to UNESCO the



implementation of Education for Sustainable Development (ESD).

Finally, ESD is recognized as a way of developing all SDGs as well as a key element of inclusive and quality education necessary to build a fairer and more sustainable world, as it has been demonstrated in our Geocentres Project “Geopaca Folk Feat Gil Cordero” Music Sessions.

FROM FOSSILIZATION TO REVITALIZATION– TWO APPROACHES TO FISHERY HERITAGES IN THE IZU PENINSULA, JAPAN.

Dr. TSUJI Shyuji, *Research fellow/Program coordinator, Izu Peninsula UGGP, Japan.*

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As a UNESCO program, Global Geoparks strive to integrate Intangible Cultural Heritage (hereafter “ICH”) with geological and natural heritages in their program planning. However, such attempts have not yielded significant results, particularly in Asia. A major challenge faced by Geoparks is the reconciliation between the Convention for Safeguarding Intangible Cultural Heritage (hereafter “the Convention”) and old-fashioned domestic heritage laws. This presentation highlights the conceptual gaps between the Convention and domestic heritage laws, which natural scientists may well overlook and focuses on the Izu Peninsula Global Geopark as an example.

In the early 20th Century, fishery villages in the Izu Peninsula were an epicentre of anthropology in Japan, which emerged as a counteraction against the rapid westernization in the previous century. A few studies that focused on folk cultures in Izu fishery villages were a forefront of this movement. As a natural consequence, those studies commonly tinted nostalgia for fisherfolk’s life in the past. Curiously, the scholars had strong influence on the national cultural policies. Their campaign successfully resulted in the designation of “important intangible cultural assets” to preserve “eroding remnants of memories”. The old fishing gears in Numazu were among the earliest designated heritages under this new category. However, this approach is inconsistent with the 2003 convention, which premises ceaseless transformation of the intangible cultural heritages and pursues the revival and safeguarding of ICHs, rather than treating them as static relics of the past. A pitfall for Geoparks is that an inventory based on the domestic designation system will fail to mirror the spirit of UNESCO’s convention.

Taking these points into consideration, the Izu Peninsula Geopark deviates from strict adherence to the national inventory. Further, its secretariat highlights the dynamic process through which these community heritages are evolving. For instance, the secretariat encourages some local restaurants to offer new recipes using salted bonitos, which is on the edge of extinction. However, adopting this item as a geo-tourism attraction remains controversial as the item used to be exclusively consumed to celebrate NewYears’ days among the fishing community. As a global geopark, the secretariat chooses to showcase UNESCO’s approach to ICH, where transformation is allowed for the purpose of successful transmission.

GEO-EDUCATIONAL ACTIVITIES IN KULA-SALIHLI UNESCO GLOBAL GEOPARK

Tuncer Demir Ahmet, serdar Aytaç Mesut, Kolbüken Ali, Karataşn Yiğit Karakuzu

The Kula-Salihli Geopark is located in the central part of the Gedizgraben in the Aegean Region, in the western part of the Inner West Anatolian Plateau. The geopark contains evidence from more than 200 million years of Earth's history, from the Paleozoic metamorphic rocks to prehistoric volcanic eruptions, and in this respect, it is home to a very rich geodiversity. With all this richness, the area is a field laboratory in terms of Earth sciences.

Besides its importance in terms of Earth sciences, the Kula-Salihli UNESCO Global Geopark also constitutes one of the rare areas of Turkey in terms of historical, cultural, and archaeological significance. Therefore, this area has been the home of human activity from prehistoric times to today, and there is a rich heritage from Prehistoric, Lydian, Roman, and Ottoman periods.

Kula Salihli Geopark, which contains all of these richness, makes a significant contribution to the region's long-term socio-economic and cultural development. In this regard, Geopark not only leads significant local training initiatives but also collaborates on a number of national and worldwide training initiatives. The aim of this study is to introduce geoeducational activities and best practices of the Kula Salihli UNESCO Global Geopark.

GEPARK AND GEOHERITAGE VIRTUAL FORUM, PLATFORM FOR SHARING AMONG MEMBERS OF ASIA PACIFIC GEPARK NETWORK

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Langkawi Research Centre under the Universiti Kebangsaan Malaysia that located at the Langkawi UNESCO Global Geopark has been collaborated with Institute for Geology of Malaysia to provide platform for sharing on geopark and geoheritage for Asia Pacific Region. The virtual forum that begins with promoting awareness and among the Malaysian geologist particularly practitioner have been extended to the regional with the request from the participants and the need to see best practice across the region. Since the programs are conducted during pandemic, most of the invitations are for UNESCO Global geopark in the Asia Pacific region. This virtual program was started with the introduction to geopark and geoheritage and geopark in the region, followed by another six series that looking at the geoheritage conservation, linking geology and biology, linking geology and cultural, community engagement, geohazard and geopark and geotourism approaches in the region. Although most of the program conducted as talk show forum via zoom, later some short presentation and poll have been added to the event.

The virtual forum not just playing a role of providing platform for best practices, create awareness, give CPD point to the geologist in Malaysia, promotion to each national or global geopark but also networking among the practitioner. Each of the forums often attended by more than 100 participants and consist almost equally number of students from the university and the practitioner. Through this program seven UNESCO and National geopark from Malaysia, two from China, two from Thailand, two from Indonesia, two from Japan and one each from Vietnam and Taiwan have been actively presented in the forum. By the 7th forum the participant is already reaching to other country such as Philippines, Morocco, Bangladesh and India.

This virtual have been successfully bring awareness among the Malaysian geologist and public as well as practitioner from across Asia Pacific region. It also strengthens partnership between several agencies that involved in geoheritage and geopark in the country while forging new partnership with the regional UGGP across the Asia Pacific region. In the near future this virtual forum will getting deeper in to topic within UNESCO global Geopark while expanding partnership to the university and agencies involve in geopark in the region,

JAMBI UNIVERSITY'S ROLE IN USING GEOPARK TO TRIGGER REGIONAL GROWTH IN MERANGIN JAMBI UNESCO GLOBAL GEOPARK (MJUGGP), INDONESIA

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A geographical area that has high value geological diversity and geological heritage, including biological diversity and cultural diversity the integrated into it, which is developed with three main pillars, such as conservation, education and local economic community development. The importance of conserving geopark areas in Merangin Jambi UNESCO Global Geopark as an effort to maintain geological heritage in an environmental sustainability setting. This conservation is one of the efforts to help the natural environment in maintaining sustainability from adverse effects of world climate change that is happening now and in the future. The role of University of Jambi in utilizing the existence of geopark as an effort to realize of MJUGGP and local communities, including them benefit from economic developments that occur, as a positive value from the presence of geopark. In the study is a combination of relevant previous study data, coupled with and interpretation of geological diversity. In the use of geoparks, the most important of the natural existence of phenomena and outcrops of the landscape and rocks as a wealth of natural resources is the development and growth of the region, sustainable development, increasing the number of visits, and increasing the local to national economy. In this case Jambi University plays a role as a balance and the role of academics. In this case the University of Jambi plays a role as a balance of the existence of the geopark. It gets the use of the geopark to trigger regional economic growth in the MJUGGP. The role of the University of Jambi through the center of excellence for Merangin Geotourism Science and Technology is how to promote the importance of geopark education. This role will later have an impact on the conservation of geological heritage and of course, sustainable economic development. The presence of MJUGGP makes a real contribution, among other things to regional development, increasing community resilience from disasters, educating people on a good life by respecting diverse cultures, providing job opportunities for people with geotourism, and establishing cooperation between regions and countries in utilizing geological diversity for environmental sustainability.

KARING ANCIENT VOLCANO PLAYS A ROLE IN THE OCCURRENCE OF CLIMATE CHANGE DURING CARBON-PERMIAN IN THE DEPOSITION OF PERMIAN SEDIMENTS IN MERANGIN JAMBI UGGP

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The presence of lithic tuff at the MuaraKaring provides information about volcanoes fossil that were active in ancient times. In the Late Carboniferous was an event that became the key to geological diversity in the Permian age, one of which was the eruption of the Karing Ancient Volcano at the MuaraKaring, Merangin Jambi UNESCO Global Geopark territory. The volcanic eruption that occurred at that time was believed to have an important role in climate change which caused the deposition of in the Mengkarang Formation. The aim of this research is to provide information about climate change that occurred due to volcanic eruptions at that time, thus providing a consequence of the depositional of geological diversity from the Mengkarang Formation, such as wood fossil and leaf fossil. This research begins with a comprehensive review of previous research regarding lithological features in stratigraphic consist that consider the tectonic setting that influences of the Mengkarang Formation. Stratigraphic traverse measurements were carried out on two traverses are TelukGedang and MuaraKaring traverses on the BatangMerangin Streams. At the field stage observing the stratigraphic arrangement of exposed volcanic products along MuaraKaring, which is believed to be a product of the Ancient Karing Volcano. Observations were also made on several stratigraphies traverse in the field which represent of Mengkarang Formation the exposed in the western and eastern parts of the Batang Merangin Stream on the Air Batu of Merangin Jambi UGGp and also the southeastern part of MuaraKaring. Based on the results of the current research, the TelukGedang traverse shows stratigraphic consist of tuffaceous agglomerate, tuffaceous graywacke and claystone with brachiopods fossil, tuffaceous graywacke and Agathoxylon wood fossil, sandstone, tuffaceous graywacke, sandstone, and limestone with brachiopods, gastropods and fusulines contain that unit lithology. This stratigraphic unit indicates the depositional environment of shallow marine to delta front. On the other site of MuaraKaring traverse obtained a stratigraphic unit composed of alternation metapelite and metapsamite, tuffaceous lithic, basaltic lava, and tuffaceous agglomerate. The stratigraphic arrangement is formed in the lacustrine to deltaic sediment environment. Volcanic products in the form of tuffaceous agglomerate that exist in both stratigraphy traverse have an impact on the presence of fossils, whose life requires humid conditions with warm climate in the process of their formation during Carboniferous – Permian.

LESVOS ISLAND UNESCO GLOBAL GEOPARK (GREECE) AS AN INCLUSIVE TERRITORY: INITIATIVES ON GEOHERITAGE ACCESSIBILITY FOR IMPAIRED PEOPLE

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The accessibility to the geological monuments, the sites of the Lesvos Petrified Forest and the other geosites of Lesvos Island UNESCO Global Geopark, for people with impairments, is a key priority of the Natural History Museum of the Lesvos Petrified Forest, the management body of Lesvos Island UNESCO Global Geopark (Greece). Working towards this direction and in line with the SDG target 10.2 that urges to empower and promote the inclusion of all irrespective of disability, the Museum implements actually two main actions.

The first action improves the accessibility to the Lesvos Petrified Forest Park at "Kyria Apolithomeni" site, that covers an area of 40 hectares and it is located at the southern slope of a hill belonging to the mountain complex of Ordymnos. Successive layers of pyroclastic materials contain impressive fossilized trees that can be observed at the excavation sites along the walking paths. The Park constitutes the flagship of the Lesvos Petrified Forest, a protected Natural Monument, and the most significant geological heritage site of Lesvos Island UNESCO Global Geopark. It is the first open air park of the Petrified Forest, opened in 1987, and the most visited one, hosting numerous of emblematic petrified trees.

Due to the steep terrain it was not until after the interventions, possible for people with mobility impairments to access the most impressive fossils of the park. Through the investments that have been made the last two years, funded by the European Union from the NSRF 2014-2020 North Aegean, pathways have been widened and their inclination has been reduced in order to improve the accessibility of the sites and also allow the electric vehicle that has been purchased, able to carry persons on wheelchair, to transfer them to the sites. The infrastructure created is fully in line with the natural environment, the material that has been used is local stone and the interventions do not disturb visually the landscape.

The second action is focused on the development of an application for the visually impaired, aiming to bring visually impaired visitors in contact with the Lesvos Petrified Forest and the geological heritage of Lesvos Island UNESCO Global Geopark. In the frames of the ERASMUS+ project "Geology for visually impaired people" (G4ViD) has been developed a mobile applications aiming to introduce our geological heritage and the Geosites of UNESCO Global Geopark areas to visually impaired people. Through this application, visually impaired people have the opportunity to enjoy the experience of UNESCO Global Geoparks.

Visually impaired visitors with the use of sound and vibration can perceive the geosites during a field visit. The Museum in collaboration with the Department of Electrical Engineering and Computer Science of the University of Patras, the Liepājas Neredzīgo Biedrība (Liepāja society of the Blind) Latvia, the Red Cross special school of Cyprus, the CEIP LA JARA school from Spain and OPENCOM I.S.S.C. an ICT company in Northern Italy participate in the development of this application. The aim is to make our geological heritage accessible to the visually impaired giving them the opportunity to enjoy the experience of Geoparks and introduce them to the Earth Sciences.

Inclusiveness is very important for the UNESCO Global Geoparks. All visitors have the right to enjoy the unique sites and services we offer and we owe to respond to this demand.

USING PROCESS-BASED COMPUTER VISUALIZATION TO REVEAL HIDDEN GEOLOGY AT AUGGP SCHELDE DELTA

Johan van de Koppel and Walter Jonkers

AUGGp Schelde Delta

Geoparks in mountainous areas usually contain spectacular geologic formations that highlight formation processes. In flat parts of the world such as the Scheldt estuary, geology may be much more hidden, limiting the general public's appreciation and understanding of geodiversity, and how past geologic processes affect human habitation. Here, we propose a process-based computer visualization implemented on geosites to show how past geomorphological features, such as tidal creeks and past landscapes formed and determined human settlement. This provides attractive digital offerings for geotourism and further enhances interdisciplinary scientific research. Moreover, with this approach we want to emphasize that reactivation of tidal processes in an estuarine area could improve the resilience to sea level rise of a landscape that currently resides below sea level.



*Computer visualization of a village in the 12 century developing along a (at that time) active tidal creek, with people making a living on a salt marsh open to flooding by the sea. **MY VILLAGE, MY FOSSIL ; AN***

OPERATION TO RECONNECT INHABITANTS AND THEIR GEOHERITAGE

Vautrin Quentin

There can be a real gap between the palaeontological richness of an area and the way local people perceive it. Raw scientific knowledge can easily appear, complex and, ultimately, of little interest to local people. That's why it's vital to promote our geoheritage through scientific outreach. More than 700 fossil species have been found in the Causses of Quercy, an area internationally well-known by paleontologists. However, the region's inhabitants are largely unaware of the importance of their territory and the geoheritage they encounter on a daily basis, especially since many of the discoveries were made decades ago. Some know that fossils have been discovered, but not really to whom they once belonged.

The Causses du Quercy UNESCO Global geopark has therefore launched the "Mon village-Mon fossile" (My village-My fossil) initiative to raise awareness among local residents about some of the region's geoheritage. As part of this project, which combines art and science, seven statues of prehistoric animals were erected in seven villages in the geopark. These statues were not chosen at random, but represent seven animals named in honor of the village where they were discovered. All the statues are accompanied by explanatory panels, describing the animal, its environment and its period, as well as anecdotes.

This work was carried out with the municipal staff. Throughout the project, they were proud to discover the international scientific renown that these fossil species brought to their commune, and to know that their village had witnessed a scientific discovery.

The statues were placed in strategic locations, such as village squares, parking lots and churches. These animals, once completely unknown and to the townspeople, are now familiar and instantly recognizable figures.

« Mon village, Mon fossile » is a growing project. Other statues are in the pipeline, and as part of the Geopark's tourism strategy, events are regularly organized around them to keep this heritage alive.

GEOROUTES OF THE ATLANTIC GEOPARKPROJECT: PROMOTING THE LOCAL HERITAGE FOR THE TERRITORIAL DEVELOPMENT IN CENTRAL PORTUGAL

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The rocks that sculpt the territory of the Atlantic Geopark Project (AGP) region (Central Portugal) have a long history of more than 600 million years. This encompasses an impressive geodiversity that is materialized in a unique way in its landscapes, geological resources, and in the interaction with the culture of its inhabitants.

The geological record of this territory covers a wide range of geological time, from the Neoproterozoic until the Holocene. In effect, it is one of the most geodiverse areas of Portugal, which covers the opening and closing of the Rheic Ocean, the formation and break-up of the Pangea, and the opening of the North Atlantic Ocean. The geologic record preserves many of the processes subjacent to these geological events, in different magnitudes and occurrences. Some of these are already designated of international relevance as the Bajocian GSSP or the Bathonian ASSP, both in the Middle Jurassic that crops out in theFigueira da Foz municipality.

With the encouragement and active involvement of the Local Action GroupAD ELO, recently was done an exhaustive inventory of the geoheritage of the six municipalities involved in this project: Cantanhede, Figueira da Foz, Mealhada, Mira, Montemor-o-Velho and Penacova. Furthermore, this territory corresponds to a coherent geographical unit that has strong institutional, economic and cultural ties beside the international geological heritage.

One of the initiatives to promote and consolidate the AGP consisted into create two main georoutes in the territory. These called and “Route of the Rocks” respectively, create a narrative along the diverse geosites of the whole AGP and other natural and cultural sites. This territorial promotional strategy intends to explain the holistic inheritance of the territory, thus contributing to local sustainable development.

Regarding the “Route of the Water”, currently water is considered a non-renewable natural resource, which is under extreme threat due to the demands of a growing population, agriculture, and industry, and the worsening impacts associated with climate change. This reality is largely the result of disturbances introduced by the action of living beings in the hydrological cycle. In this sense, the AGP territory is rich and diverse in terms of water resources, with rivers, springs, fountains, wells, spas, irrigation canals, ponds, waterfalls, and even flood plains, which turns it into a true living laboratory for understanding this reality. This route contemplates 53 hydrological geosites.

Concerning the “Route of the Rocks”, the significant geodiversity of the AGP territory is the result of the weathering of the outcropping rocks in the higher reliefs and their transformation into fertile sandy and clayey soils. Bounded to the south by the Mondego River and to the north by the Vouga River, the different watercourses of these two hydrographic basins were, together with the tectonics, great sculptors of the landscape that is deeply linked with the local cultural tangible and intangible heritage and economic activities. This route contemplates 42 geosites.

These two routes, being complementary but differentiating from the current tourist offer, are a new and innovative resource for territorial interpretation based on geoconservation, geoeducation, and geotourism, offering visitors a unique experience. Thus becomes a base that allows contributing to sustaining and reinforcing local development.

G geoparks, sustainable tourism and local development partnership strategy and joint promotion: "I am Geopark"

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The Orígens UNESCO Global Geopark is located in Spain and it covers an area of more than 2.000Km². In Orígens Geopark you can travel back in time to discover how the Pyrenees mountain range formed or how the last dinosaurs of Europe lived. Amongst this outstanding geological heritage, the people are among the most precious value as they are the ones to protect it and to use it in a sustainable way for their livings.

The participation of social agents is fundamental to geoparks. For this reason, the Geopark management body has engaged official agreements with private and public institutions with the objective to create a local network that will contribute to the Geopark development and guarantees its sustainable development. Following a recommendation from the UNESCO Geopark designation letter in 2018, the Geopark started to elaborate a new partnership strategy with a clear methodology on the criteria to become a stakeholder.

As consequence, the Geopark devised strategy addressed to private entities comprising the criteria to be accomplished by the applicants. For example, the entity needs to be linked to the territory, legally constituted and meet the geoparks objectives of sustainability. It is also required to identify "Geopark products", products or services in accordance of sustainable criteria and contribute to the visibility of the Geopark. The strategy also involves a follow up of the agreements throughout the submission of an annual report and a more extended report every 4 years.

The strategy was launched in 2019, together with an application form, on the Geopark's website and social networks. Then the applications were assessed and the selected candidates were interviewed, concluding with the signature of 20 agreements. Following a further recommendation from the Geopark revalidation process in 2021, expressing the need to attract new partners and using the existing ones as ambassadors, the Geopark started a new application process involving the update of the previous strategy and the submission of new applications. This process finished in May 2023 with over 30 new signed agreements. Therefore, today there are more than 50 private stakeholders including artisans, agrifood producers, guiding enterprises and travel agencies.

Since 2019, some activities of joint promotion have been carried out. Regarding the visibility of the Geopark, enterprises are using the Geopark logo on their webpage, in joint activities leaflets and in their products. Moreover, stakeholders have installed a sign at the entrance of their business that identifies them as a "Stakeholder of the Geopark". The Geopark provides them with training activities encompassing background information on the Geopark and more specific coaching related to the geological heritage of the area where they guide, so they can share it to their customers. Finally, the Geopark started a promotional campaign with short videos "I am Geopark" where stakeholders present their activity and describe the Geopark and the territory importance to them.

In conclusion, the strategy carried out by the Geopark paired with the stakeholders' enthusiasm has made them true Geopark ambassadors that have also become one of the agents that gives value to this territory in a win-win relationship with the Geopark.

THE GEOLOGICAL AND ASTRONOMICAL HERITAGE OF THE CHARLEVOIX ASPIRING GEOPARK

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The Charlevoix region is located at the intersection of three major geological provinces covering at least 1,5 billion years of Earth's history, allowing to view a wide variety of geological environments and features: the Canadian Shield, the St. Lawrence Platform, the Appalachians, an astrobleme, and glacial drifts and landscape of the last Ice Age.

Yet the highlight of Charlevoix is its 54-kilometer wide astrobleme, a wound left in the Earth's crust caused by a meteoritic impact more than 400 million years ago. Lidar image and enhanced digital terrain model clearly show the contour of the ancient crater as well as the central uplift caused by the impact. Presence of shatter cones, impact breccias and melt rocks are further proof of the meteoritic impact. The resulting topographic depression is characterized by a microclimate that made the area suitable for human activity, years before the arrival of European explorers.

The meteoritic origin of the Charlevoix Astrobleme also allows to go beyond the geoheritage of Charlevoix and explore its "astroheritage", the genesis and mechanisms that regulated the formation of solar systems, planets, stars, galaxies, and even elements at the other end of the spectrum. All this makes Charlevoix only the starting point to discover and explore the universe.

There are already many activities in future Géoparc de Charlevoix: Astronomical and Astrobleme Observatories, a Geotrail, guided geological tours, an educational program and interpretation trails. And many projects are underway:

- the enhancement of the Great Alliance Indigenous Historical Site at Pointe aux Alouettes,
- ongoing mapping of the territory with the discovery of new geosites with impact features,
- a collaboration agreement with the Charlevoix Biosphere Reserve for geoheritage conservation and
- an accredited geoguide program.

Efforts are also being made to involve local inhabitants and educate them about the origin of Charlevoix, so they will become ambassadors of Charlevoix to the whole world.

REVITALIZING GEOPARKS: STEM ARTIFACTS AND A TREASURE HUNT GAME

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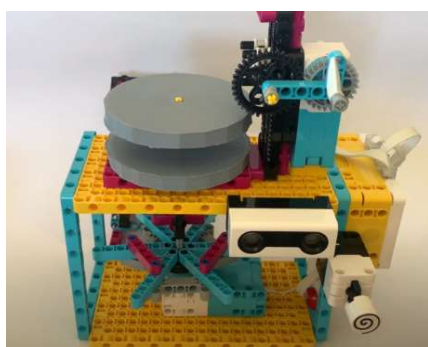
Introduction: In order to enhance and improve the attractiveness of Sitia's (Crete, Greece) and Troodos (Cyprus) geoparks, areas of natural and cultural interest, we introduced STEM education activities that promote the importance of "water elements". Furthermore, a treasure hunt game was developed to promote these areas as cultural and geological destinations.

Methods: The introduced STEM games include simple constructions using common materials, as well as more advanced Lego robotics kits, related to activities on water management such as Archimedes screw and the watermill mechanism. Treasure hunt offers a webpage that can be used to design activity-based treasure hunts. Treasure Hunts can act as valuable tools that offer rich pedagogical potential for both students and the general public.

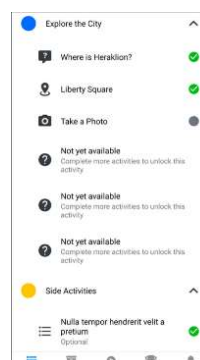
Results: The developed materials can enhance the visibility and attractiveness of the geoparks where the artifacts take place. They also can serve as educational tools that could be utilized as portable museum kits. Moreover, these activities strengthen essential 21st century educational skills such as problem solving, critical thinking, creativity, communication and collaboration.

Conclusion: Utilizing the above methods and technologies could lead to developing fun educational activities aiming to inform and advance the scientific knowledge of residents, tourists, students and entrepreneurs during their recreational/educational visits to the geoparks.

Acknowledgements: This publication is financed by the Project "Strengthening and optimizing the operation of MODY services and academic and research units of the Hellenic Mediterranean University", funded by the Public Investment Program of the Greek Ministry of Education and Religious Affairs.



(a)



(b)

Figure 1. STEM watermill (a) and treasure hunt activities interface (b)

PRESERVATION OF CULTURAL HERITAGES FOR FUTURE GENERATIONS:STONE HERITAGES OF SAKURAJIMA-KINKOWANGEOPARK

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In April 2023, a stone bridge called Kinzan Bridge was added to our geological site. It is an arched stone bridge built in the Meiji period (1880) and was used to transport raw materials from the gold mines. Historical structures like this, being deemed as geological sites, help residents recognize their value, leading to their preservation. In this presentation, I would like to introduce the unique "stone heritages" developed in the Sakurajima-Kinkowan Geopark area and discuss the significance of designating cultural heritage as geological sites.

Sakurajima-Kinkowan Geopark is located in Kagoshima Prefecture, the southernmost part of Japan's mainlands. At its centre is Aira Caldera, which erupted about 30,000 years ago. Kinko Bay, formed by the caldera eruption, and the still active Sakurajima volcano, are the symbolic features of the Geopark. The series of volcanic activities in this area has greatly influenced the local culture.

Many historical structures in Sakurajima-Kinkowan Geopark and its surrounding area are constructed using welded tuff, a soft and easy-to-process stone. Welded tuff is formed when pyroclastic flow deposits from caldera eruptions and gets compressed by its weight and heat. Apart from Aira Caldera, the Geopark area and its surroundings also have two other calderas (Kakuto Caldera and Ata Caldera), each producing welded tuff with unique characteristics. As a result, different types of tuff have been used for various purposes. The Kinzan Bridge was constructed using abundant welded tuff from the area.

Sakurajima-Kinkowan Geopark provides opportunities for people to explore geodiversity, including local history through geological sites, and also raises awareness about the importance of cultural heritage. Through these efforts, we aim to ensure that residents recognize the value of cultural heritages and contribute to their preservation for future generations.

PRELIMINARY STUDY ON FOSSIL CONSERVATION IN YANQING UNESCO GLOBAL GEOPARK, CHINA

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Geo-conservation is one of the most significant responsibilities taken by UNESCO Global Geopark. Yanqing UNESCO Global Geopark, located in Beijing, China hosts petrified wood fossils and dinosaur footprints with international significance. In order to implement geo-conservation on petrified wood fossils and dinosaur footprints, Yanqing Geopark signed a twinned geopark agreement with Lesvos UNESCO Global Geopark, which is one of the founding members of Global Geoparks Networks with rich experiences of fossil conservation through the platform of the Global Geoparks Network. This agreement results in implementation of joint geo-conservation in Yanqing Geopark with support of Lesvos Geopark. For testifying the outcome of geo-conservation on petrified wood fossils and dinosaur footprints samples, this paper use Xenon lamp and freeze-thaw experiments to stimulate ultraviolet radiation from sunshine and temperature change in natural condition. Different chemicals (styrene-acrylic latex and acrylic emulsion) are also used in the experiment to conclude a better material for fossil conservation. By comparing the water absorption and weight change of samples, acrylic emulsion is considered as a more proper geo-conservation solution. A comprehensive geo-conservation method on fossils is summarized. Furthermore, the joint geo-conservation program in Yanqing Geopark also set a very excellent example for geopark collaboration on platform of Global Geoparks Network.

DEVELOPMENT OF PALEONTOLOGICAL INTERPRETATION IN KHONKAEN GEOPARK USING BRAIN-BASED LEARNING (BBL)

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The development of this paleontological interpretation project using brain-based learning (BBL) aimed to fulfill several objectives:

1. To assist students in memorizing five KhonKaen Geopark's scientific dinosaur species names, all of which are long and complicated to young learners.
2. To observe satisfaction of students toward the development of interpretation materials utilizing brain-based learning.

The sample population group consists of 120 primary and secondary school students in the area. This experimental research is a One-Shot Case Study with research tools divided into 3 categories:

1. Experimental tools including 6 BBL Learning management plans with dinosaur mascots in a form of dinosaur mascot costumes, dinosaur paper toy models, LINE stickers, and 2D animation. The criteria behind the design are as follow: 1) Students are mentally and physically ready 2) They are stimulated from 5 physical senses along with their spark of interest 3) Their mood affects their learning progress 4) the lesson starts from easy and gradually rank up the difficulty and 5) the focus is on "Active Learning"
2. Tools dedicated to assess students' educational performance in memorizing scientific dinosaur names
3. Satisfactory assessment form that analyzes data using Mean, Standard Derivation (S.D.), and Percentage

The research findings revealed that a significant majority of students, specifically 105 out of the total participants (87.50 percent), demonstrated successful memorization of scientific dinosaur names. This achievement was attributed to the combined use of dinosaur mascot costumes, LINE stickers, and 2D animation. The incorporation of these elements not only raised students' interest but also had the potential to improve their overall performance. The introduction of "nicknames" for dinosaurs proved beneficial as it helped establishing a mental connection between simpler, more relatable concepts (nicknames) and complex scientific terms. Additionally, engaging students in hands-on activities such as creating paper toy models of dinosaurs resulted in enjoyable and effective learning experiences. The overall satisfaction level among students was estimated to be quite high.

Notably, the three primary aspects contributing to their satisfaction were:

1. Students enjoyed the lessons
2. Students feel more confident in interpreting and communicating information, also,
3. The activities allow them to share their opinion.

THE SURVEY AND EVALUATION OF GEOLOGICAL HERITAGE AND ITS POPULARIZING TO PUBLIC IN SOUTH KOREA

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“The Survey and Evaluation of Geological Heritage” project, initiated, by the Korea Nation Geopark Secretariat under the umbrella of Ministry of Environment in 2014, aims to identify, evaluate, and promote the geological heritage within geoparks. This project involves the discovery and evaluation of geological sites across the country, both known and unknown, from the geopark’s perspective. The evaluation criteria were divided into two: one is the intrinsic category that evaluates geological heritage based on the elements of geology and geomorphology such as representative, rarity, diversity, specificity, size, naturalness, and esthetics; and the other is the additive category that evaluates other values of each geoheritage, for example, for soil, ecology, tourism, and accessibility, etc. The grades of geological heritage are assessed based solely on intrinsic values, with five grades, while the values of additive category are used only for reference. This project has been conducted on both the mainland and islands. The mainland work was completed in 202, and the island work is still in process. This project not only builds a basic database of Korea’s geological heritage but also helps municipal governments to initiate a new geopark project and develop existing geoparks or build geo-trails and can be a reference for the research of geologists and geomorphologists as well. Every year each project is finished, the results are published in an e-book and the GIS data is open to the public.

A PRACTICAL CASE STUDY OF AN ESD EDUCATION PROGRAM WITH A GAME-LIKE CHARACTERISTIC IN ASO, JAPAN

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Education for sustainable development (ESD) is UNESCO's education sector response to the planet's urgent and dramatic challenges.

In Aso, the area of grassland that has lasted for millennia has been decreasing due to population decline and changes in the industrial structure, and educational programs to learn the importance of grassland had been conducted before the Geopark program began. However, when the Geopark program started in Aso, the close relationship between geodiversity and biodiversity began to be recognized, then Geopark learning was started.

We have been conducting educational activities on this ESD for elementary through high school students through Kumamoto Prefecture's grant program (Scrum Challenge). This educational activity involves not only Kumamoto Prefecture, but also local activity guides, university students, the National Aso Youth Friendship Center, the Ministry of the Environment, and local learning groups.

In 2021 and 2022 What makes this program unique is that the children do not learn from the teacher, but rather they search for wonders and explore their own questions in the geosite. To get them hooked on this wonder, we create a movie-like setting "Aliens came to steal Aso's treasures!" and The students solved the riddles posed by the aliens through observation of the geosites. Moreover, this program is not designed to be answered by a single school but to provide the final answer by connecting multiple schools online. This type of game-based education effectively develops the seven capabilities and attitudes ESD requires. And through this program, our educational values are gradually changing. How can we create independent learning in each country through this presentation? We would like to discuss this.

ESD emphasizes seven competencies and attitudes, and to develop these competencies and attitudes, it is necessary to bring out the initiative of children.

Competencies and attitudes to be emphasized in ESD

1. Ability to think critically
2. Ability to plan with anticipation of a future scenario
3. Ability to think in multidimensional and integrative ways
4. Ability to communicate
5. Ability to cooperate with others
6. Attitude to respect relations and connections
7. Attitude to participate proactively

INTEGRATING THE SUSTAINABLE DEVELOPMENT GOALS AS COMMUNICATION AND STRATEGIC TOOLS IN BERGSTRASSE-ODENWALD UNESCO GLOBAL GEOPARK, GERMANY

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The Bergstrasse-Odenwald UNESCO Global Geopark has celebrated in 2022 its 20th anniversary and looks back to a multifaceted development. In 2002, the Geopark became member of the European Geoparks Network, followed by the Global Geoparks membership in 2004, and finally the UNESCO Global Geopark status in 2015.

At the same time, in September 2015, the United Nations have agreed with the Global Agenda 2030 on 17 Sustainable Development Goals (SDGs). This agenda is aimed at ending poverty, hunger and inequality, protect the planet and opening the way for environmentally-friendly progress. The 193 member states of the United Nations have committed themselves to implement these goals by 2030, which now need to be incorporated from the international level down to the smallest community.

Bergstrasse-Odenwald UNESCO Global Geopark, Germany, has started to communicate the importance of the SDGs and the role, which UNESCO Global Geoparks can play in this context, in 2016. Investigating the common activities and tasks, it was obvious, that the Geopark already supports a series of SDGs without mentioning it to the members and the public so far. At the same time, the SDGs were not known in principle, respectively considered as just theoretical numbers without impact.

This opened the Geopark a potential to directly communicate the connection between own activities and their support of the SDGs, like: Hiking, sports activities and awareness campaigns support SDG No. 3. The broad offers of Education for Sustainable Development activities for all ages by the Geopark Rangers support SDG No. 4. SDG No. 8 and 12 are supported by the intense cooperation with the regional tourism and products as well as sustainable development. The "Climate Hero" campaign directly supports SDG No. 13, whereas the biodiversity and soil projects underline SDG No. 15. By creating and implementing a huge regional network, the Geopark also supports SDG No. 16 and with the international activities including twinning with European and worldwide UNESCO Global Geoparks SDG No. 17.

After UNESCO's declaration of the UNESCO Global Geoparks as model territories for Agenda 2030, the Geopark has even intensified activities by developing SDG postcards, SDG seats, SDG information on the Website, SDG column in the Geopark magazine, SDG training for Geopark Rangers and stakeholders inside the territory as well as catalyst function of the SDG Working Group (EGN/GGN).

On the strategic level, the Geopark has incorporated the Agenda 2030 into its management plan as overall vision and umbrella, which was launched in 2020. During executive board meetings and general member assemblies, the Geopark informs regularly on all ongoing activities in connection with the SDGs. After 7 years, the decision makers and members understand the high importance of SDGs much better, because they connect them with the hands-on activities of the Geopark – and the Geopark uses the SDGs as aspect of strategic planning. At the same time, the role of the Geopark as interface between regional activities and international exchange makes it an ideal place to understand the relevance of the SDGs and also the responsibility of their implementation.

Finally, the overall approach of protection, community participation and capacity building as well as Education for Sustainable Development and networking activities underlines clearly the relevance and potential of UNESCO Global Geoparks worldwide as active player in supporting the SDGs and preserving for a common sustainable future on our planet Earth.

SUSTAINABLE TOURISM AND LOCAL DEVELOPMENT IN THE CAÇAPAVA UNESCO GLOBAL GEOPARK OF SOUTHERNMOST BRAZIL

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The recently certified Caçapava UNESCO Global Geopark (UGGp) is a large (3,047 km²) territory, whose limits coincide with the administrative boundaries of the Caçapava do Sul municipality (33,000 inhabitants) of southernmost Brazil. There, internationally relevant geosites are the *Guaritas* dissected plateau, the *Segredo* dissected cuesta, and the *Minas do Camaquã* abandoned copper mining town, surrounded by hogbacks. The sedimentary rocks (sandstones, conglomerates) that make up those geosites are part of the '*Camaquã* Basin', the best record, on a continental level, of the 'transition phase' of evolution of the South American Platform, from 600 to 500 Ma (Eldiacaran to Cambrian). Sustainable tourism activities and products comprise: (a) outdoor sports such as rock climbing and paragliding (Fig. 1A, B); (b) hiking and trekking through municipal nature parks, with well-established trails (Fig. 1C); (c) urban walks at the historical district, highlighting the *Dom Pedro II* Fortress; (d) the *Juarez Teixeira* Culture House, displaying everyday objects of the 19th and 20th centuries, as well as itinerant exhibits; (e) visits to olive groves (near geosites) and tasting of exquisite olive oil varieties (geosites on the labels, Fig. 1D); (f) rural experiences and hostelling in sheep farming and wool yarn production (Fig. 1E, F, G); and (g) thematic handicraft and food (geo)products. It is important to refer that the UGGp strategy and the partnership network have increased optimism and entrepreneurship in the territory. The diversity of activities and possible experiences, as well as the long distances within the UGGp are factors favouring longer stays for tourists, and potentially more income to the economy. Recently established small and/or family businesses are mainly led by women, who are also the majority of tourism guides. Visibility and interest about the territory have increased because of the certification as UGGp, and it can be envisaged a future of tourism improvement, as well as sustainable and responsible, economic and human, local development.

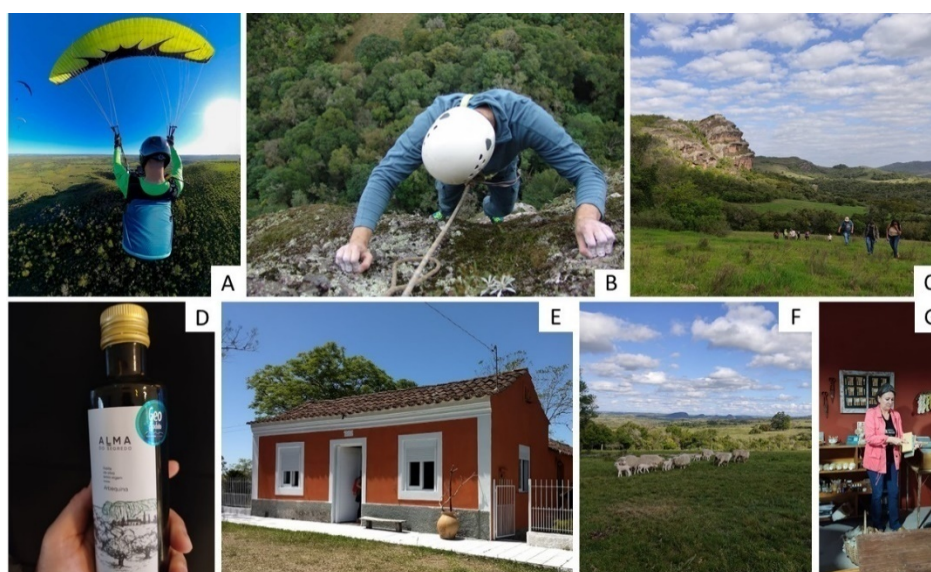


Figure 1 – Activities and products of sustainable tourism in the Caçapava UGGp: (A) paragliding, (B) rock climbing, and (C) hiking in geosites; (D) olive oil with the *Segredo* geosite on its label and a geo-product stamp; (E) the *Guaritas* Hostel and the activities (F, G) of the *Santa Marta Farm and Yarn Factory*, both enterprises located inside the *Guaritas* geosite.

BELITONG DECLARATION ON SUSTAINABLE ISLAND GEOPARKS: A GUIDELINES TO SECURE AND PROTECT MARINE ENVIRONMENT IN ISLAND GEOPARKS BY YOUTH INITIATIVES

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The ocean plays a crucial role in climate regulation as it has the capacity to absorb carbon dioxide, and it is highly valuable as a resource for scientists seeking innovative biological approaches to combat climate change⁶. As an integral part of the climate system, coastal and marine areas are also home to various communities, and therefore, any damage or imbalance to marine ecosystems indirectly affects those residing in these regions⁷. In response to this, a dilemma arises among local communities, stakeholders, and the youth generation in harmonizing these three key aspects: preserving coastal and marine environments, actively engaging in preventive actions against climate change, and promoting the well-being of coastal regions for sustainable economies. It is crucial to address this dilemma collectively, considering the interests of all generations, as it would be challenging to accomplish solely by one generation without considering the well-being of future generations. To address this dilemma, we call upon the geopark youth and local communities to voice their aspirations and take concrete actions on the aforementioned issues, enabling the geopark to fulfill its vision of empowering local communities while ensuring sustainable environmental considerations through the Belitong Declaration on Sustainable Island Geoparks. There are three key essential part of Belitong Declaration (1) stimulating the development of island geoparks through blue economy concepts; (2) harnessing the role of youth in fisheries and marine conservation and research; (3) involving youth in the development of island geoparks as a means of regeneration. Through this declaration, we hope that all aspirations put forward by the engaged youth, along with their ideas and insights, can be transformed into solutions for geopark youth, particularly those residing in coastal areas. This will allow for the synergistic integration of aspects aimed at preserving coastal and marine environments, actively engaging in preventive actions against climate change, and promoting the well-being of coastal regions through sustainable blue economies.

ISLE OF ARRAN, SCOTLAND, UNITED KINGDOM

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The Isle of Arran is known as ‘Scotland in Miniature’, sitting astride the Highland Boundary Fault, and showcasing many aspects of the country’s highland and lowland geology. The island’s rocks record an incredible journey from south of the equator over a 600 million year period.

Arran Geopark has been described by the Geological Society as “one of the best locations for fieldwork in Europe”. It is included in their list of 100 Great Geosites for its importance as a location for learning and understanding geology.

Arran is enormously important to the history of the science. The island is home to James Hutton’s first unconformity where the ‘father of modern geology’ changed human understanding of the age of our planet. Our youngest rocks record the opening of the Atlantic Ocean and these account for around half of the island’s land area.

The island’s mountains and coastline provide a rich collection of textbook glacial features. As the last ice sheets retreated, the presence of man is evident on Arran from around 6,000 years ago. The island is home to some of the most spectacular standing stones in northern Europe and one of the greatest concentrations of Neolithic monuments in the UK,

The island’s great geodiversity is also the driver for its unique biotic heritage. There are three tree species endemic to Arran, one of which – the Catacol Whitebeam *Sorbus pseudomeinichii* – is considered by the IUCN to be one of the rarest trees in the world.

The island’s biodiversity doesn’t end on dry land, however. The Community of Arran Seabed Trust (‘COAST’) is a pioneering community-led project whose scientific research and tenacity led to the designation of large parts of our marine environment as a Marine Protected Area (‘MPA’) and No Take Zone (‘NTZ’).

Arran’s population is only around 4,600 people; however, this swells over the summer months, attracting 250-300k visitors per year. The island has been a popular tourist destination since the early 19th century, with outdoor activities such as walking, cycling, and wildlife watching being especially popular.

Arran Geopark’s vision is that “our environment and heritage are conserved, enhanced, and valued for their contribution to people’s well-being and Arran’s sustainability”. We see UNESCO status as a catalyst to drive diverse benefits to our island’s community, environment, and economy – working towards an island in balance.

EXPLORING THE ROLE OF DIGITAL TOOLS IN UNESCO GLOBAL GEOPARKS: PERCEPTIONS, UTILISATION, AND CHALLENGES

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UNESCO Global Geoparks serve as protected areas aimed at conserving and promoting thematic geodiversity, including its associated cultural and biodiversity elements, of international significance. Geoparks are present across all continents, with Asia and Europe boasting the highest number of parks, some of which are the oldest. Over time, the conceptualisation and implementation of UNESCO geoparks has evolved and refined in conjunction with advancements in methods for assessing, detecting, and communicating geodiversity.

This presentation delves into the integration of digital tools within the current and future workflows of Geoparks. The study involved interviews with the chairs of Global and Regional Geoparks networks, as well as senior representatives from emerging geoparks networks. By employing a semi-structured interview method, the aim was to gain insights into the participants' perceptions and utilisation of digital tools within their respective networks.

Subsequently, a survey was conducted among 109 UNESCO global geoparks worldwide, focusing on capturing detailed information about their usage of digital tools and the challenges they encounter.

The interview findings shed light on the diverse applications of digital tools within the Geoparks networks. The survey responses from geopark professionals further provided a comprehensive overview of the specific ways in which digital tools are employed, while highlighting the associated challenges faced by the practitioners. Understanding the current landscape of digital tool usage in UNESCO Global Geoparks yields crucial insights that offer valuable perspectives on the opportunities and challenges encountered. The research underscores the importance of leveraging digital technologies to enhance geopark workflows, foster educational initiatives, empower local communities, and promote effective geodiversity conservation on a global scale.

PIONEERING UNIVERSAL GEOTOURISM AT A KARST PLATEAU GEOPARK

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The United Nations' Sustainable Development Goals (SDGs) are based on the basic principle of leaving no one behind. This principle is also crucial for Geopark activities. Persons with disabilities and older persons often live in socially marginalized conditions and face challenges in living under the same conditions as the rest of the population. Geoparks offer various geotours, but wheelchair users, older persons, and persons with disabilities are limited to touring barrier-free facilities. Since geotours often involve outdoor sightseeing, it is necessary to prepare outdoor tours that persons with disabilities, older persons, and persons without disabilities can enjoy together. We believe that we should aim for the achievement of sustainable universal tourism that can be enjoyed by all, including persons with disabilities and older persons, by improving outdoor tourism such as geotours. Outdoor activities such as walking, trekking, marathons, and guided tours are popular on the gentle Akiyoshidaikarst plateau. Karstar, the base facility of Miné-Akiyoshidai Karst Plateau Geopark, offers geotours where visitors can walk on the karst plateau while learning about the geology, topography, and biodiversity of the area. Akiyoshidō Cave, the second longest limestone cave in Japan, is designed so that visitors can learn about stalactites, aquatic life, groundwater, and cave formation while walking around the cave. However, although the paths are generally gentle, the ground surface is uneven, making it challenging for wheelchair users to navigate. The geotour of the limestone cave can be even more challenging, as there are huge rocks that have collapsed from the ceiling and walls which block the way and make it impossible for wheelchair users to move freely. Currently, the geotours of the karst plateau are very challenging for persons with disabilities and older persons to participate in. To address this issue, we propose using a special wheelchair called Hippocampe wheelchair, which can be supported by persons without disabilities. This would allow persons without disabilities and persons with disabilities or older persons to explore the karst plateau and limestone cave together. In October 2019, we organized a tour for persons with severe disabilities, where they travelled on the paths of the karst plateau and explored the limestone caves. Prior to the tour, students from Yamaguchi University received training in operating Hippocampe wheelchairs and became certified to support persons with disabilities. With Hippocampe wheelchairs, persons with severe disabilities can travel around the area, climb stairs and steep slopes inside the limestone cave, and take part in a geotour while being supported by four to five persons without disabilities who have obtained the relevant certification. This allowed them to tour the entire sightseeing route while using a wheelchair, which was a first for the limestone cave. In order for the geopark to be sustainable and accessible for persons with disabilities and older persons so that they can freely participate in geotours alongside persons without disabilities, it is necessary to deploy wheelchairs, establish safe and comfortable routes, and adjust the explanations of geology and topography. We also confirmed that there were still many issues to address. We will continue to work towards establishing universal geotours that can be enjoyed by all, including persons with disabilities and older persons, alongside persons without disabilities.

THE ACTIVITIES OF MINÉ-AKIYOSHIDAI KARST PLATEAU GEOPARK IN AIMING FOR UNESCO RECOGNITION STATUS

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Miné-Akiyoshidai Karst Plateau Geopark is an aspiring UNESCO Global Geopark located in south-western Japan. Known for its karst plateau, limestone cavern, coalfield and ancient copper mine, the geopark has been working to conserve the geological, natural and cultural heritage within Mine City and to facilitate the sustainable development of the local community since its certification as a Japanese geopark in 2015.

The geopark has undertaken various projects and initiatives across numerous fields including conservation, education, natural hazard awareness and geotourism to aid its journey towards becoming a UNESCO Global Geopark. A key initiative that underpins all of these has been the establishment of the geopark information center, Karstar, which has played a crucial role in determining the current success of the geopark. Karstar acts as a hub for geoguides - certified members from the local area who offer guided tours – who are able to offer geotours to all visitors. The promotion of geotours and the coordination of professional development programmes for geoguides have led to a greater awareness of the geopark both within the geopark territory and across Japan.

Since its national certification, Miné-Akiyoshidai Karst Plateau Geopark has collaborated with geoparks within Japan and the Asia-Pacific Geopark Network, and is currently preparing to sign a Memorandum of Understanding with Dong Van Karst Plateau UNESCO Global Geopark in Vietnam. The new partnership agreement between the two geoparks that share similar karst landscapes will allow for the geoparks to share research findings and good practices on the conservation of karst features, and for Miné-Akiyoshidai Karst Plateau Geopark to learn from an experienced UNESCO Global Geopark.

Miné-Akiyoshidai Karst Plateau Geopark is also striving to become a geopark which is more accessible for visitors from abroad by providing all material in Japanese and English, teaching English to geoguides, increasing the opportunities that local community members get to interact with other cultures and networking with geoparks from abroad in order to achieve this. Such measures are thought to contribute to the internationalisation of the geopark, which in turn will prepare the area for becoming a UNESCO Global Geopark.

Although there are many laudable aspects of Miné-Akiyoshidai Karst Plateau Geopark and ways in which it may contribute to the APGN and GGN, there are also issues alongside these which the geopark must address. Future actions will include building stronger partnerships with organisations within the local community, implementing measures to better conserve geological heritage and refining the overarching message that the geopark seeks to communicate. The geopark will continue to make great efforts in such areas in order to achieve the UNESCO Global Geopark status.

GEPARK BASE FACILITIES AS A PLACE FOR COMMUNITY ENGAGEMENT AND EDUCATION

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The Oki Islands UNESCO Global Geopark encompasses four inhabited and many uninhabited islands located in the Sea of Japan, about 40-80 km north of Shimane Peninsula (southwest of mainland Honshu). The geopark area consists of both the land and the marine area up to 1 km from the coastline, with a total area of 673.5 km² (land area 346.0 km² and marine area 327.5 km²).

The geopark aims to have base facilities in the ports at the entrance of each island, in which visitors can gain information about the geopark sites and the islands, further promoting tourism of all four islands.

In October 2020, a new base facility was established in Saigō Port (Okinoshima Town). In addition, the Geopark Management Bureau, contracted by the town as designated managing organization, has moved its office to this base facility, making it easier for both visitors and local residents to obtain information about the geopark. Together with the Geopark Museum that opened on the second floor of this facility in April 2021, the building functions as a gateway into the geopark, with exhibitions about the geopark sites and facilities, and general tourism information combined in one place.

In July 2021, a hotel (formerly Marine Port Hotel Ama) reopened as Entô, a geopark hub and a place to stay. The first floor functions as a geopark base facility. The facility includes both provision of information and exhibitions on the geopark, the Oki Islands, and the Earth. The geopark is contracted by the town to provide guiding, plan events and help with management.

This presentation will introduce the concept of the facilities and discuss the management challenges and results that have been achieved since the opening of the two facilities above, in the fields of education and local community engagement.

SCIENCE POPULARIZATION ACTIVITIES IN NINGDE UNESCO GLOBAL GEOPARK

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Ningde UNESCO Global Geopark became a member of the GGN on October 3rd, 2010. In recent years, it is difficult for us to host science popularization activities in person due to Covid-19. Thus, we explored other methods to propaganda popular science. Firstly, we actively took part in science popularization online activities organized by CGN, like the Earth Day themed common activity, the Cultural and Nature Heritage Day themed common activity, and the National Science Popularization Day themed common activity. Secondly, we collaborated with our partner to display geo-heritages on TikTok for 6 times, reaching more than 100,000 viewers, and to invite experts as volunteers to host lectures in colleges nationwide. Thirdly, we cooperated with partner schools to set up extra-curriculum to introduce our geopark, compile textbook about our geopark and host ceramic making competition.

GEPARKS AND GEOTOURISM IN CHINA: A SUSTAINABLE APPROACH TO GEOHERITAGE CONSERVATION AND LOCAL DEVELOPMENT

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Geoparks and geotourism are relatively new activities within tourism. However, both have grown rapidly over the past decade. Geoparks, as an innovation for the conservation of geoheritage, play an important role in the development of geotourism. Geotourism has evolved partially in response to the need to minimize the negative impacts of mass tourism in geologically and geographically sensitive and/or important areas situated in tourist environments, while at the same time providing a catalyst for sustainable rural development. China, with its vast territory and complex geological and geomorphic features, is often referred to as an open laboratory in geosciences and has 289 national geoparks and 41 UNESCO global geoparks so far. Currently, it is a leading country in the world in establishing and maintaining geoparks. This paper reviews the geoparks initiatives in China, as well as attempts to assess the compatibility of geoconservation and rural development within geotourism areas by exploring the challenges and outcomes of the geotourism development in China and by identifying and analysing the outcomes of geopark development. The results indicate a geopark is a sustainable approach to advancing geoconservation and promoting local economic development. The results further emphasize the importance of sustainable management in geotourism. Only when managed in a sustainable manner is geotourism likely to provide long-term improvements for developments in rural areas. Implications for geopark management and geotourism development are discussed.

THE "MT. DANXIASHAN MODEL" OF THE DEVELOPMENT OF GLOBAL GEOLOGICAL PARKS

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Mt. Danxiashan joined the World Geopark Network in 2004. Relying on the advantages of the Danxia landform named place and scientifically famous mountains, it has developed into an outstanding example of the world geopark. Mt. Danxiashan actively supports scientific research, and basic scientific research feeds back the accumulation of popular science materials, promoting the output of popular science and the continuous update of the popular science explanation system. This article sorts out and summarizes six core stakeholders in the development of research bases: government departments, local communities, tourism operating companies, travel agencies, research institutions, mentors and study travellers. This article summarizes the formation process and mechanism of the development model of the "Study Tourism Base" (STB) in Mt. Danxiashan and constructs the "1+4+1" development model of the STB Base in Mt. Danxiashan. This model can be described as "the government departments lead the construction of the base and guide tourism companies, local communities, travel agencies, and tutors work together to provide services for study travellers". This model responds to the interests of all parties, exerts the functions of each role, and achieves the ultimate goal which is the development of the STB.

In addition, Danxiashan actively promotes social participation in popular science education, which has been summarized into six stages: to take stock, bringing in, going out, communization, socialization, industrialization. This study summarizes the above content as the development Mt. Danxiashan Model.

Key words: DanxiashanUGGp; Science Popularization; Study Tourism Base; UNESCO Global Geopark brand

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DISTRIBUTION OF GEOHERITAGES CONTROLLED BY GRANITE DOME STRUCTURE IN WUGONGSHAN ASPIRING GEOPARK

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The Wugongshan Geopark is located in the junction area of Pingxiang City, Yichun City, and Ji'an City in Jiangxi Province, covering a total area of 1470.82 km². It is situated in the northern section of the Luoxiao Mountains on the border of Hunan and Jiangxi Provinces. Wugongshan has obvious dome structural characteristics, with a complete core-mantle-boundary structure, and is composed of granites in the core, extensional detachment faults, and overburden layers. The Wugongshan Dome controls the formation and distribution of important geological heritages in the Geopark, which is mainly reflected in the vertical zoning of the geological landscapes. From the high to the low altitude are formed the alpine meadow on gneissic granite weathering crust (>1,600m) on the top of the dome, granite peak forests (1,600-1,200m) on the upper part of the dome, Z-shaped steep slope waterfall groups (1,200-500m) in the middle of the dome, and the ring-shaped "hot springs chain" (<500m) around Wugongshan at the edge of the dome. Meanwhile, there are rich natural landscapes, distinctive flora and fauna, and human resources including a Taoist Altar with a history of more than 1700 years and intangible cultural heritages. Indeed, Wugongshan Geopark presents itself like a pearl embedded in the Luoxiao Mountains.

CASE STUDY ON UNESCO GLOBAL GEOPARK POPULAR SCIENCE ACTIVITIES -- TAKING MOUNT DANXIASHAN AS AN EXAMPLE

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Conducting popular science education activities is one of the important tasks of UNESCO Global Geoparks, and popular science education activities can strongly promote the development of popular science tourism and benefit the community residents. As an explorer of popular science education activities in geoparks, Danxiashan has built a diversified team of experts and a system of popular science education talents, actively carried out scientific research, exploited its local resources and characteristics, built a thorough system for scientific research and knowledge supply, and transformed scientific research results into popular science education materials and innovated the content of popular science education activities. Relying on its popular science education activities Danxiashan has innovated the brand-oriented development of popular science tourism, built multi-type system of popular science tourism products and services based on community involvement, and formed the "Danxiashan Paradigm" featured by building a diversified talent system, promoting scientific research, innovating popular science education activities, creating the popular science tourism brand, encouraging community participation, and industrializing popular science education. Danxiashan has also strengthened its cross-system, cross-disciplinary and cross-border cooperation and exchange to share authoritative and high-quality popular science resources and introduce to the world Danxiashan's brand "famous mountain of science".

TRANSFORMING VALUELESS, DISUSED QUARRY INTO A 'GOLD MINE': THE YANDANGSHAN'SCHANGYU CAVE EXPERIENCE

Young Ng PhD, National Geotourism Strategy, Australian Geoscience Council

The Changyu Cave is located in the eastern part of Yandangshan UGGp of China. It is one of the largest man-made cave systems in the world. It is a complicated cave system comprising 300 ancient open pits and over a thousand more modern, underground quarry sites. In the past 1,500 years, it had served as a quarry site for volcanic tuff and breccia as construction materials for dwellings, bridges, floodgates, household, statues, and farming tools. Open-pit quarrying was avoided to prevent causing damages on the exterior appearance of the landscape for environmental and 'feng shui' reasons. The materials were quarried by hollowing the Cretaceous volcanic hills in the area through unique quarrying techniques to form the current relics of bench-like, perpendicular, bell-like, and underground pits. Since the termination of its operation in the 1990's, engineering and safety works have been done to enable the safe transformation to become a tourist attraction. Since then, these massive pits, their entrances and the interconnected paths were upgraded and renovated to accommodate a tunnel of the quarry's history, a magnificent indoor geological and cultural museum, several Buddhist and Taoist temples, a large concert hall, an extensive exhibition hall of gigantic rock carvings of religious figures, gods, and goddesses. This important geological heritage site demonstrates the importance of the strong linkage of geology to the local economy, history, and culture. It also sets an example of reviving disused quarry and mining sites, improving, and protecting the environment, fostering sustainable development, and bringing direct socio-economic benefits to the local people.

Keywords: man-made cave, disused quarry revival, mining heritage, sustainable development

THE NATIONAL GEOTOURISM STRATEGY OF AUSTRALIAN GEOSCIENCE COUNCIL: DRIVING REGIONAL DEVELOPMENT IN AUSTRALIA.

Dr Young Ng, National Geotourism Strategy Reference Group, Australian Geoscience Council

Australia has long been one of the preferred tourist destinations in the Asia Pacific region. Its attractions mainly include safe and clean environment, exotic wildlife, unique aboriginal culture, quality food and wine. Relatively speaking, the tourism potential of Australia's natural landscape has often been underestimated and under promoted. The Australian Geoscience Council Inc (AGC) is the Peak Council of geoscientists in Australia. It represents eight major Australian geoscientific societies with a total membership of over 8,000 individuals of industry, government, and academic professionals in fields including geology, geophysics, geochemistry, mineral and petroleum exploration, environmental geoscience, geotourism, hydrogeology, geomorphology, and geological hazards. As an effort of the Australian geoscience community in contributing to geoscience popularisation, community engagement and tourism development, AGC has launched its National Geotourism Strategy (NGS) in April 2021 with seven clear strategic goals, each with an individual working group comprising professional members in relevant areas. The presentation will briefly introduce this new approach in addressing the hidden geoscientific and tourism values of Australia's natural landscape and geoheritage, with the dual objectives of protection and sustainable usage. This holistic strategy not only establish a pathway for Australia's geopark development, it also regarded as a model for other countries with similar geopolitical environment to promote geotourism and geoparks.

Keywords: geotourism, geoheritage, Australian Geoscience Council, National Geotourism Strategy

STUDY ON OPTIMIZATION OF TOURISMPRODUCTDEVELOPMENT BASED ON GEOPARK RESOURCES, CASE OF QINLING ZHONGNANSHAN UNESCO GLOBAL GEOPARK

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Endowed with abundant geological heritage sites, the Qinling Zhongnanshan UNESCO Global Geopark is an epitome of the Qinling orogeny. It is an important base for studying the geological history of the QOB, including evolution mechanics, plate subduction, collisional suture zones, mountain collapse-slides, glacial occurrence and the origin and evolution of humans. The Qinling Zhongnanshan Geopark comprises a number of geological heritage sites of global significance. It is also a mosaic of geological entities of special scientific importance, rare animals and plants, vestiges of *Homo erectus*, and fantastic religious cultures, forming a three-dimensional and multi-level landscape. With the development of tourism in Xi'an city, the Qinling Zhongnanshan Geopark has become a famous tourist destination with great attractions, a pillar industry for the local economy and a major part of the tourism industry in Shaanxi province.

By introducing the samples of tourism product in the Qinling Zhongnanshan Geopark, this paper describes the current situation of tourism development and intends to initiate further discussions and research on this issue to promote the sustainable use of tourism. The aim of tourism development is not only to widely promote the UNESCO Global Geopark brand, but also to empower local social and economic sustainability.

Key words: Qinling Zhongnanshan UNESCO Global Geopark, Tourism Product, Sustainable Tourism

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SUSTAINABLE TOURISM AND LOCAL DEVELOPMENT TO INCREASE TOURISM VALUE OF GEOPARK MAROS PANGKEP

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One of the geoparks newly established by UNESCO is the Maros Pangkep Geopark (MPG), which is situated in South Sulawesi's Pangkajene dan Kepulauan Regency (Pangkep) and Maros Regency. MPG can develop into a major tourist destination thanks to its extensive coverage, which extends up to the islands. To fully actualize MPG as a leading eco-tourist-based tourism with a local knowledge approach, the use of sustainable tourism is crucial. Several settlements that place a high priority on maintaining a connection to nature and local wisdom are found in the MPG region of Pangkep Regency. For instance, island cultures always begin fishing activities with maccera lopi activities; these activities include both prohibited items and items that are permitted in fishing. Communities also exist in mountainous forests where nature is both a source of life and a friend. With a number of customs and laws that they follow, such as the requirement that honey harvesting only be done between the dates of the 12th and 16th of Hijri between the months of September and December, these mountain villagers humanize nature. The primary subjects that can propel and maximize ecotourism-based sustainable tourism activities in the MPG region are local communities that inhabit and protect the places where they reside. Therefore, it is crucial that they participate if they want the tourists that come to use the local wisdom values they uphold. In order to preserve MPG as an ecosystem and as a biosphere for tourism, education, and research, partnership between local communities and MPG is required.

Keywords: Sustainable tourism, local wisdom, local development, sustainable development, tourism value, Geopark Maros Pangkep, Kabupaten Pangkep

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“PALEOTOCAS” GIANT PALEO BURROWS: THE DATA ACQUISITION PROCESS INSIDE AN UNCOLLECTABLE ICHNOFOSSIL

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The South America giant paleoburrows (paleotocas) is a shelteric ichnofossil bioeroded by Xenarthrans mammals during the Pliocene-Pleistocene. Proposed ichno taxonomically as *Megaichnus minor* and *Megaichnus major* by Lopes et al., 2017, its classification is mainly given by the diameter of the tunnel. Tunnels which high range goes from 0.6 m to 1.5 m is known as *M. minor*, and its genesis is given by giant ground armadillos which inhabited South America during the last Ice Age. The tunnels understood as *M. major*, however, are much larger, which high goes from about 2 m, 4 m wide, and length can surpass 50 m. Its bioerosion related to giant ground slots sheltering behavior. However, the recognition of a paleotoca is also related to the presence of claw marks on the tunnel walls, which must be subcircular/elliptical in shape and presents resting and turning/nesting chambers. Commonly found with entrance eroded and/or lixiviated, some paleoburrows have all its extension completely filled by sediments, and thus, it is named *Crotovina*. Hundreds of giant paleoburrows are known so far in Brazil, mostly concentrated in its southern states: Santa Catarina and Rio Grande do Sul. The Southern Canyons Pathways UNESCO Global Geopark (Geoparque Mundial da UNESCO Caminhos dos Cânions do Sul) is situated on Santa Catarina and Rio Grande do Sul states border, involving 7 municipalities in its area. The canyons which loan its name to the Geopark are eroded on Serra Geral Formation basalt flows, underlain by Botucatu Formation sandstones, which create high angle slopes almost taller as 1.000 m. The weathering resistance of the basalt and the slope gradient provides protection and natural conservation for the most unique giant paleoburrows, inside the UNESCO geoterritory. Its identification and mapping process are made through field excursions on the canyon's walls, through the Atlantic rainforest. Some paleoburrows, however, are known within the inhabited areas of the municipalities which easy access allows its public visitation (e.g. Xokleng and Palmiro paleoburrows). So far, almost 30 *Megaichnus* were fully mapped through the compass mapping process, after the careful exploration of its tunnels. The 3D photogrammetry technique is being also tested and already showed a powerful technique not only for data acquisition but also for scientific communication and patrimonial conservancy. This field effort shown already *M. major* and *M. minor* occurrences, which tunnel complexes can surpass 100 m in extension. The study and conservancy of such unique and uncollectable fossils are the main goal of a joined project and its scientific divulgation and sustainable tourism a challenge under development of SCP Global Geopark."

RESEARCH & INNOVATION IN GEOTOURISM AND GEOPARKS DEVELOPMENT OF INDONESIAN GEOPARKS NETWORK

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This study examines the commitment of the Indonesian Geoparks Network (IGN) to sustainable development and conservation of geological heritage, with a particular focus on the role of IGN in promoting sustainable practices and environmental conservation. IGN serves as a collaborative network platform for 10 UNESCO Global Geoparks (UGGp), 9 National Geoparks, and 5 Aspiring National Geoparks, aiming to become a world-class organization in country geopark development.

The research underscores the significance of studying geotourism and geoparks for sustainable development. Research contributes to the understanding of the environmental, social, and economic aspects of geoparks, facilitating the identification of potential negative impacts and the development of effective management strategies. It also encourages responsible practices for the long-term preservation of natural and cultural heritage.

This presentation presents various research topics and examples from Indonesian geoparks, showcasing the breadth of study areas within geoparks. These topics encompass geodiversity, biodiversity, cultural diversity, social mapping, geopark initiation, and collaborative research. It highlights the valuable contribution of academic institutions and researchers in conducting geopark-related research, leading to publications and innovative strategies for community engagement, education, and sustainable resource management.

The study describes the innovative strategies implemented by IGN to enhance community engagement, education, and sustainable resource management. These strategies empower local communities, develop interactive and experiential educational programs, and implement sustainable tourism practices. IGN collaborates with stakeholders, integrates geopark-related topics into the curriculum, and employs technology for immersive educational experiences. The network also prioritizes assessing carrying capacity, implementing sustainable practices, and cultivating alternative livelihoods in collaboration with local communities.

In conclusion, this study highlights the cooperation between IGN and AGC (Australian Geoscience Council) in promoting geo-conservation efforts, geoscience education, and geotourism in both countries. It also showcases the details of the Geotourism Festival and International Conference in Rinjani-Lombok UGGp, presenting various geotourism packages available in Indonesian geoparks. The study emphasizes IGN's commitment to sustaining the world through research, innovation, and collaboration to enhance the value and preservation of geoparks in Indonesia.

Keywords: geotourism, Indonesian Geoparks Network, geoconservation

STUDY ON THE CONSTRUCTION STATUS AND SCIENCE EDUCATION METHODS OF QINLING ZHONGNANSHAN UNESCO GLOBAL GEOPARK

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Qinling Zhongnanshan UNESCO Global Geopark is one of the important global geoparks in China. Its unique geological structure and diversified geomorphic landscape attract a large number of tourists to visit and explore. However, in the process of geopark development and construction, there are some issues that need to be addressed, such as the impact of geopark development on the ecological environment, and the lack of popular science education. Therefore, the purpose of this paper is to study the construction status and science education methods of Qinling Zhongnanshan Geopark, with a view to providing valuable reference for the management and science education of the global geopark. First of all, Qinling Zhongnanshan Geopark is briefly introduced; Secondly, the science education conditions of Qinling Zhongnanshan Geopark are analyzed, and the science education mode is designed; Finally, some suggestions are put forward to strengthen the science education work of Qinling Zhongnanshan Geopark. Based on analysis of the current status of the science education, this paper proposes corresponding suggestions on providing better science education experience to visitors. The significance of this study is to help geopark managers better understand the current situation of the geopark, master the effective methods of geopark science education, and further enhance the popularity and attraction of Qinling Zhongnanshan UNESCO Global Geopark.

Key words: Qinling Zhongnanshan UNESCO Global Geopark; Science education; Suggestions.

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HOW TO BUILD THE GEOHERITAGE INTERPRETATION SYSTEM TO THE GENERAL PUBLIC

Zhanqian Lu

The geoheritage Interpretation system utilizes software and hardware facilities to disseminate scientific information about geopark and geoheritage to tourists. The geoheritage interpretation system is an indispensable carrier for the scientific popularization of the geopark. It can enable tourists to have a clear understanding of the overall characteristics of the geopark, types and characteristics of geoheritage, geological phenomena and the scientific knowledge behind them. And it is an important way to improve the scientific quality of citizens. This article takes the software and hardware construction of geoheritage interpretation in Yanqing UNESCO Global Geopark as an example to discuss how to do a good job in the construction of geoheritage interpretation system of the Geopark. It will elaborate on the compilation standards of geoheritage interpretation words, the types and functional settings of geoheritage interpretation panels, the design method of visitor center interpretation content. In addition, this article will elaborate how to compile the commentary content of geopark museum, how to equip science popularization facilities, and how to build the commentary ability of geopark tour guides and so on.

MOUNT CHANGBAISHAN ASPIRING GEOPARK

ZHAO Yueming

Changbaishan Geopark is able to achieve sustainability in conservation, research, capacity-building, and economic and cultural development with a series of activities and initiatives from 2020 to 2023. Forty-six campaigns were conducted to identify safety hazards, make rectifications, and reinforce protection and conservation efforts.

A total of 36,000 routine patrols were implemented with the mileage amounting to 447,000 kilometers. The wildlife rescue station was expanded, and five new geological exhibition rooms were created. Changbaishan Geological Museum and Geopark School were upgraded and renovated. The signage system in the Geopark with 1,603 information boards and signs and Geopark's official website have been redesigned and updated. The tourism facilities maintenance was also conducted.

In addition, twenty-two research projects have been carried out by Changbai Mountain Academy of Sciences and Changbaishan Volcano Observation Station, with 86 academic papers published and 23 patents taken out. They have provided solid technical support for science-based management in the Geopark. More than 800 school students and over 200 college teachers students participated in the educational activities the Geopark has organised, and the associated reports on the official website and social media platforms reached out to a wider audience. In these three years, the Geopark has received approximately 6.06 million tourists through geo-tourism, eco-tourism, cultural tourism and integrated tourism operations. In order to learn and promote the good practices and experiences in geopark management, study visits to Fangshan, Yanqing, and Zhangye Global Geoparks were organised, and fifteen training seminars and workshops with more than 3,500 participants were held.

Cooperation agreements with 8 higher education institutions including Jilin University were signed with the aim to further enhance the management capacity at Changbaishan Geopark. Three geology books have been developed to supplement its public education efforts. Cooperation agreements have been signed to establish partnerships with 33 partners, and a sister park relationship in particular with Zhangye Global Geopark. Despite the COVID epidemic, the 2020 Changbai Mountain International Ecological Conference of China was successfully convened and a donation of anti-COVID supplies was made to Nebrodi Park of Italy.

RESEARCH ON THE CONTENT DESIGN AND CREATION OF GEOSCIENCE POPULARIZATION READINGS ABOUT SONGSHAN GLOBAL GEOPARK TAKING "THE SECRET OF MOUNT SONG" AS AN EXAMPLE

Zhou Jianmin

The Songshan area is known as the "Natural Geological Museum" for its complete exposed strata with clear sequence and abundant rock types. The thick geological history and rich research results require the easy-to-understand transformation and output of hard knowledge, with the process called "soft landing". Animation IPs in Geoscience popular readings have both entertainment and dissemination capabilities. Due to its storytelling content-force and adaptability, high quality content of these readings is beloved by primary and secondary school students and other non-professionals, and also has good dissemination and science popularization effects. The article takes the science popularization book "The Secret of Songshan" as an example to analyze the integration process of science popularization key points and animation content creation, try to summarize ideas and experiences, and explore a new path of science popularization which is interesting, storytelling and full of positive energy.

IMPORTANCE OF THE KARSTIC SYSTEM IN PROTECTING THE RELICT DADES TROUT *SALMO MULTIPUNCTATUS* (TELEOSTEI: SALMONIDAE) AGAINST CLIMATE CHANGE IMPACTS IN THE M'GOUN GEOPARK, HIGH ATLAS RANGE, MOROCCO

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Among the characteristics of the karst areas of the High Atlas range is their impermeable Triassic basalt underlying substantial subsurface reservoirs with high potential discharge rates (1). The network of karstic groundwater aquifers is extensive, probably with hierarchical flow paths. Most (70%) of the surface water is directly lost to groundwater. Infrequent, high rainfall or snow melt intensities cause a particularly high flood risk to these karst areas. In addition, agriculture and land use changes have degraded the karst areas due to permanent overgrazing and the excessively increasing use of firewood (1). Large-scale afforestation has occurred in the oro-mediterranean zone, between 2600 and 3400m, which coincides with the most important zone for karstic groundwater occurrence. The combination of high amounts of groundwater flow and rapid surface flow due to sparse vegetation has increased the problems of flood flow (1). The Dades trout *Salmo multipunctatus* is a relict salmonid species from the Draa basin, on the southern slopes of the High Atlas Mountains, Morocco. Apart from its genetic and morphological singularity (2), only few data are available about this species (3,4). Only two isolated populations exist (in the Dades and M'Goun catchments, occupying an extremely small range, <22km of stream reaches in a narrow altitudinal range (c. 2150-2375 m).m). The Somatic condition increased with altitude. Climatically suitable areas will be confined to mountain summits without permanent water bodies by 2080. A constant low water temperature (9°C) of well-oxygenated cold-water spring fed streams, ensure suitable spawning sites and spring and summer refugia. The low concentration of nitrates (4 ppm at Aflafal karst spring (1)) indicates low agro-pastoral activities in these areas.

Estimated present and forecast future habitat suitability for the Dades trout across sub-catchment units in the Dades and M'Goun basins. Future suitability is forecast under two contrasting (optimistic and pessimistic) climate scenarios. Suitability is shown only for sub-catchments with minimum elevation >1,500 m (3)

The Dades trout is a Critically Endangered species that requires active management for its persistence.

We propose actions for the long-term conservation of the species, including catchment-scale erosion control, riverbed restoration, and local-scale measures to mitigate global warming effects and afforestation on both karstic system and trout survival.

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STUDY AND UTILIZATION OF THE PALAEOLOGICAL HERITAGE OF KEFALONIA ITHACA UNESCO GLOBAL GEOPARK

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The paleontological heritage is an important asset for the existence of geoparks (Grigorescu et al., 2021). Fossils and the representation of life on earth in past times through them, have proven to be one of the most important tools both for the development of alternative tourism and for the education of society and especially students about the preservation of geodiversity. In addition, they are considered of significant scientific interest and at the same time they have high aesthetic value.

Kefalonia and Ithaca (Ionia Islands, Greece) exhibit an important fossil record of organisms belonging to different taxonomic groups either of marine or terrestrial origin. At least 22 different sites have been excavated to date and fossils dating back to at least the Jurassic have been found. The marine record includes Bivalves, Gastropods, Corals, Brachiopods, fishes-both bones and teeth-, urchins, barnacles as well as Sirenia (fully aquatic herbivorous mammals). The terrestrial record includes bones of animals that do not exist in the area today, namely a hippopotamus (*Hippopotamus amphibius*) and an endemic elephant species (*Elephas (Palaeoloxodon) cephallonicus*). Moreover a fossil leaf has recently been excavated.

Due to the lack of a responsible local organization the already excavated fossils are kept in museums and laboratories all over the country. The Kefalonia-Ithaca UGGp (designated since 2022) acknowledging the importance of its palaeontological heritage has taken action in order to research, manage and at the same time exploit the palaeontological wealth of the area. The purpose of this project is the overall consideration of the paleontological inventory of the geopark and the utilization of part of it in the appropriate way. More specifically a series of actions are taking place starting from the creation of database for the palaeontological heritage of the geopark. The return of the already excavated fossils or the construction of replicas (in the case of the big mammals) is a priority for the project. Excavations (open to the public) are taking place aiming at the completion of the fossil record. The results will be announced to the scientific (in the form of scientific publications) as well as the local community. Two permanent exhibitions will be created which will be addressed to the general public and visitors of the Geopark. The project would not be complete without its educational value. The results will be used for the production of a new educational tool which will bring young students closer to the past of the area and its geological history.

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GEOCONSERVATION STRATEGY IMPLEMENTATION IN THE LESVOS PETRIFIED FOREST, LESVOS ISLAND UNESCO GLOBAL GEOPARK, GREECE.

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The Petrified Forest of Lesvos is a unique natural monument formed 20 million years ago due to the intensive volcanic activity in the North Eastern Aegean area and consists the main geological heritage feature of international significance for the recognition of Lesvos Island as a UNESCO Global Geopark (2000, 2012, 2015). The protected area of the Lesvos Petrified Forest covers an area of 15.000 ha located in the western part of Lesvos Island, Greece.

A geo-conservation strategy is implemented by Natural History Museum of the Lesvos Petrified Forest, a public institution aiming the protection and rational management of the Lesvos Petrified Forest. Rescue excavations are conducted by the Museum in the protected area of the Lesvos Petrified forest in case of fossil findings during the construction of public and private works.

During the last decade a new road is constructed connecting Kalloni with Sigri which is the westernmost village of the Island, crossing the protected area of the Lesvos Petrified Forest. During the construction of this new road, a large number of astonishing fossil sites with impressive fossilized tree trunks have been unearthed, which lay on the verge of the road. The Museum in collaboration with the Ministry of Public Works took all the necessary measures changing the road construction plan, to secure the preservation of the most significant fossil sites along the road.

The Museum implemented a comprehensive plan to enhance the new fossil sites, to protect them and to create new visiting parks along the Kalloni-Sigri road. This geo-conservation plan includes a series of interventions for the protection of the improvement of the accessibility to the fossiliferous sites, interpretation and information, signage and infrastructure for visitor services. The various fossiliferous sites along the Kalloni-Sigri road are now part of a new open air museum, unique in the world, which will offer to the Lesvos Geopark visitors a new geo-touristic attraction. In addition to various awareness raising activities, a new campaign entitled "Walk the Forest" introduces the new Petrified Forest parks to the public. The project is funded by the Regional Operational Program "North Aegean 2014-2020".