



ABSTRACT BOOK



# DIGITAL 9<sup>th</sup> International Conference on UNESCO Global Geoparks

제9차 유네스코 세계지질공원 제주 총회

December 12-16, 2021

Jeju Island UNESCO Global Geopark, Republic of Korea

2021.12.12.-16, 제주도 유네스코 세계지질공원

## FUN GEOPARK IN JEJU

 제주특별자치도  
Jeju Special Self-Governing Province

## CONTENTS

1. Organizing Committee	3
2. Session Topics	5
3. Program at a Glance	6
4. Program Timetable	7
5. Oral Abstracts	23
- Day 1 (Dec. 14)	25
- Day 2 (Dec. 15)	129
- Day 3 (Dec. 16)	181
- Workshop (Dec. 15)	227
6. Poster Abstracts	239
7. Author Index	303

## Organizing Committee

	Name	Affiliation
Executive	KOO Manseop	Acting Governor, Jeju Special Self-Governing Province
Operative	LEE Soojae (Chair)	Korea Environment Institute
	KANG Minju	Ministry of Environment
	HWANG Gyu-tae	General Affairs of the National Geopark Secretariat
	KIM Eun-young	Korean National Commission for UNESCO
	MOON Jongtae	Jeju Special Self-Governing Provincial Council
	KANG Mansaeng	Jeju UNESCO Management Committee
	KIM Beomhoon	Jeju UNESCO Management Committee
	JEONG Dai-yeon	Asia Climate Change Education Center
	CHANG Kihun	International Convention Center Jeju
	GO Jeryang	Representative of Jeju Ecotourism Association
	JWA Jaebong	Jeju Stone Park
	NOH Jeongrae	Folklore & Natural History Museum
	BOO Yongsik	Haenyeo Museum
	PARK Yeongseok	Jeju Geopark Interpreter
	KANG Mankwan	World Heritage Office, Jeju Government
	SHIN Changhun	Mt. Hallasan Research Institute, World Heritage Office, Jeju Government
KOH Junggoon	Mt. Hallasan Research Institute, World Heritage Office, Jeju Government	
Scientific (Domestic)	LEE Sung-rock (Chair)	Korea Institute of Geoscience and Mineral Resources
	HUH Min	Chonnam National University
	YOON Seokhoon	Jeju National University
	KOH Giwon	Jeju Province Development Company
	LEE Yongil	Seoul National University
	SOHN Youngkwan	Gyeongsang National University
	RYU Choonkil	Korea Institute of Geological Environments
	CHOI Taejin	Chosun University

	Name	Affiliation
	CHANG Sewon	Korea Institute of Geoscience and Mineral Resources
	PARK Jeongwoong	The Geological Society of Korea
	JANG Yundeuk	Kyungpook National University
	RYU Wansang	National Geoparks Secretariat
	AHN Ungsan	Mt. Hallasan Research Institute, World Heritage Office, Jeju Government
	JEON Yongmun	Mt. Hallasan Research Institute, World Heritage Office, Jeju Government
Scientific (International)	Miguel CLUSENER-GODT	UNESCO
	Nickolas ZOUROS	GGN
	Tim BADMAN	IUCN
	Roland OBERHANSLI	IUGS
	Asfawossen ASRAT	Addis Ababa University, Ethiopia
	Jianping ZHANG	China University of Geosciences, China
	Enas Abd Elhady AHMED	Helwan University, Egypt
	Guy MARTINI	Chair of the UGGp Council, France
	Kirstin LEMON	Geological Survey of Northern Ireland, UK
	Melanie BORDER	English Riviera Geopark, UK
	Martina PASKOVA	Czech Ministry of Environment, Czechia
	Kristin RANGNES	Gea Norvegica Geopark, Norway
	Helga CHULEPIN	Grutas del Palacio Geopark, Uruguay
	Mahito WATANABE	Geological Survey, Japan
	Ana Ruíz CONDE	Sobrarbe-Pirineos UGGp, Spain
	Xiaochi JIN	Chinese Academy of Geological Sciences, China
	Ibrahim KOMOO	University Kebangsaan, Malaysia
	Maurizio BURLANDO	Parco Nazionale Arcipelago Toscano, Italy
	Marie Luise FREY	Messel Pit WHS, Germany
	Patricio MELO	Araripe UGGp
Patrick MC KEEVER	Special Advisor to the GGN	

## Session Topics & the Number of Abstracts

### Main Session 1 Mature Geoparks—sharing Successes and Challenges

Oral Abstracts: 23 | Poster Abstracts: 7

### Main Session 2 Aspiring Geoparks

Oral Abstracts: 25 | Poster Abstracts: 13

### Main Session 3 Regional and International UNESCO Global Geopark Collaborations

Oral Abstracts: 14 | Poster Abstracts: 2

### Main Session 4 Popularizing Scientific Knowledge for Public Education

Oral Abstracts: 44 | Poster Abstracts: 8

### Main Session 5 Conservation, Science and Research

Oral Abstracts: 18 | Poster Abstracts: 8

### Main Session 6 Geoparks, Sustainable Tourism and Sustainable Local Development

Oral Abstracts: 50 | Poster Abstracts: 16

### Main Session 7 Geoparks, Climate Change and Geo-hazards

Oral Abstracts: 13 | Poster Abstracts: 4

### Special Session 1 Geodiversity of the Korean Peninsula (North and South Korea)

Poster Abstracts: 3

### Special Session 2 Management of Multi-Internationally Designated Areas

Oral Abstracts: 5

### Workshop on Education

Abstracts: 9

## Program at a Glance

GMT	December 14 (Sun)			December 15 (Wed)		December 16 (Thu)
06:00-07:00	Opening Ceremony					
07:00-08:00						
08:00-09:00	Scientific Sessions - MS02 - MS04 - MS06	Youth Forum		Scientific Sessions - MS01 - MS02 - MS04 - MS05 - MS06 - SS02	Workshop on Education	Scientific Sessions - MS01 - MS03 - MS05 - MS07
09:00-10:00			GGN AC Meeting			
10:00-11:00						
11:00-12:00				GGN General Assembly	Closing Ceremony	
12:00-13:00						
13:00-14:00						

## Program Timetable

**December 14 (Tuesday)**

### MS04: Popularizing Scientific Knowledge for Public Education

Moderator	<b>RYU Wansang</b>	<b>[Halla, 3F]</b>
(GMT) 08:00-08:15	Design Conception and Educational Function of Huanggang Dabieshan UNESCO Global Geopark Museum <b>Mengting CHEN</b>	
08:15-08:30	The Achievements of Science Popularization in Longyan Aspiring Global Geopark <b>Wensheng LIN</b>	
08:30-08:45	School Program at Langkawi UNESCO Global Geopark <b>Tanot UNJAH</b>	
08:45-09:00	Suggestion to Effective Ways to Observe Outcrops for Enhancing Visitor's Geological Interests in Muroto UNESCO Global Geopark, Japan <b>Yoshihiro KAKIZAKI</b>	
09:00-09:15	Fostering a Key Competence for Sustainability Through Geopark Education as ESD <b>Ryuta YAMAMOTO</b>	
09:15-09:30	Innovative Practice of Science Popularization in Danxiashan UNESCO Global Geopark <b>Guiqing LI</b>	
09:30-09:45	The Discovery of Megalodon Fossils (Giant Sharks) in the Ciletuh Palabuhanratu Geopark, Raises Public Awareness for Conservation and Education Activities <b>Mega Fatimah ROSANA</b>	
10:00-10:15	The Tumbler Ridge "Health in Geoparks" Project <b>Charles HELM, Manda MAGGS</b>	
10:15-10:30	Using Virtual Tools to Help Schoolteachers with Geology Education <b>Max DECK-LÉGER</b>	
10:30-10:45	Innovative Learning Methodologies and Digital Inclusion for the Promotion of Geoparks and Sustainability <b>Cristina PETRACCHI</b>	
10:45-11:00	Taking the Geopark to Schools: The Example of the Geopedagogic Box Project, of the Oeste Aspiring Geopark <b>Maria MARQUES</b>	
11:00-11:15	Estrela Educa: Making Scientific Knowledge Accessible to Children and Young People in the 21st Century <b>Magda FERNANDES</b>	
11:15-11:30	A Billion Years of Climate Heritage in the Geopark Grevena-Kozani: Field Teaching tools <b>Dina GHIKAS</b>	

Moderator	<b>LEE Sung-rock</b>	<b>[Halla, 3F]</b>
(GMT)		
12:00-12:15	Study on Effective Interpretive Panels Design for Geosites <b>Fang REN</b>	
12:15-12:30	Geodiversity, Society and International Geodiversity Day <b>Murray GRAY</b>	
12:30-12:45	Characterization of Geosites for Geoeducative Strategies: Guaranda – San Juan Road (Ecuador) as Case of Study <b>Jose Luis SANCHEZ CORTEZ</b>	
12:45-13:00	Demystifying the Cliffs of Fundy: Perspectives on Science Communication in a Newly Designated UNESCO Global Geopark <b>Caleb GRANT</b>	
13:00-13:15	Co-producing and Sharing Knowledge for Action on Coastal Risk and Resilience in the Great Lakes, Niagara Region, Canada <b>Bradley MAY</b>	
13:15-13:30	The International Observatory for UNESCO Global Geoparks: A Tool to Boost the Development and Improvement of Research, Education and Sustainable Development in These Territories <b>Artur SÁ</b>	

#### **MS04: Popularizing Scientific Knowledge for Public Education**

Moderator	<b>LEE Eunhee</b>	<b>[201A, 2F]</b>
(GMT)		
08:00-08:15	Operation of the Geopark Programs for Raising Awareness of Local and Global Issues <b>JU Seongok</b>	
08:15-08:30	Interpreting the Sites of Geoparks: A Case of Xingwen UNESCO Global Geopark <b>Kejian XU</b>	
08:30-08:45	Rainbow Mountain on the Silk Road - Zhangye UNESCO Global Geopark <b>Miao RONG (not attend)</b>	
08:45-09:00	Local Knowledge on Geoheritage in Vietnam's Geoparks - Some Preliminary Studies <b>Yen Ngoc DO THI</b>	
09:00-09:15	Education and SDGs Activities in the Oki Islands UNESCO Global Geopark <b>Takayuki FUKUDA</b>	
09:15-09:30	Geopark Education Through Project Based Learning for the Empowerment of the Local Community <b>Minamo NOBE</b>	
09:30-09:45	Operation and Improvement of the Hantangang River Global Geopark Program in the post-COVID-19 <b>KANG Suna</b>	

10:00-10:15	Culture-Based Conservation Education Approach at Sunda Geopark, West Java Province <b>Januarani RAZAK</b>	
10:15-10:30	Towards an Inclusive Interpretation of Vikos-Aoos Unesco Global Geopark Through the Project “Listen-Touch-Feel” of Ecomuseum Zagori <b>Panagiota KOUTSOUKOU</b>	
10:30-10:45	Salpausselkä Geopark Programme for Early Childhood Education <b>Kati KOMULAINEN</b>	
10:45-11:00	Time Traveller – A New, Innovative Toolkit for Geoheritage Interpretation in Rokua UNESCO Global Geopark, Finland <b>Mikko KIUTTU</b>	
11:00-11:15	The "BROMACKER" Research Project: New Ways of Knowledge Transfer <b>Mauro ALIVERNINI</b>	
11:15-11:30	Understanding Naturel Hazards with the Local Population in the Chablais UGGp, France <b>Sophie JUSTICE</b>	
Moderator	<b>JEONG Dai-yeun</b>	<b>[201A, 2F]</b>
(GMT)		
12:00-12:15	Five Years of the UNESCO Chair on Geoparks, Regional Sustainable Development, and Healthy Lifestyles – Changing the World Through Education <b>Artur SÁ</b>	
12:15-12:30	Morphodynamics of Vikurfjara Beach, South Iceland <b>Jóhannes M. JÓHANNESSON</b>	
12:30-12:45	Markers, to Shift Paradigm! <b>Christophe LANSIGU</b>	
12:45-13:00	Society and Science: Geoheritage Education at Stonehammer Geopark <b>Catrina RUSSELL</b>	
13:00-13:15	Discovering ‘Discovery’: Using Local Paleontology and Geology to Inspire Students to Become Custodians of Their Geological Heritage <b>Christopher MCKEAN</b>	
13:15-13:30	Environmental Education: Geopark and Upper Secondary School Co-operation <b>Kaisa TÖRMÄ</b>	

## MS06: Geoparks, Sustainable Tourism and Sustainable Local Development

Moderator	<b>CHANG Sewon</b>	<b>[201B, 2F]</b>
(GMT) 08:00-08:15	The Growth of an Ecological Agricultural Corporation Within Huanggang Dabieshan UNESCO Global Geopark, China <b>Li FENG</b>	
08:15-08:30	Development of Geological Tourism of Shennongjia UNESCO Global Geopark <b>Qian CHEN</b>	
08:30-08:45	Toba Caldera Geopark: The Opportunities and Challenges in Coping with Environmental Degradation <b>Betti Betharia S. NAIBAHO</b>	
08:45-09:00	Implement of Cross-Curricular Learning Education Program Based on Geopark in Muroto UNESCO Global Geopark, Japan <b>Tsubasa OGASAWARA</b>	
09:00-09:15	Revitalizing Cultivated Land on a Marine Terrace <b>Narimi WADA</b>	
09:15-09:30	Safe Tourism After COVID-19, Examples in the South-Central Coast of Vietnam <b>Chi HOANG THI PHUONG</b>	
09:30-09:45	Developing Community-Based Tourism Model in Dak Nong UNESCO Global Geopark <b>Van TRAN NHI BACH</b>	
10:00-10:15	Establishment of Wugongshan Aspiring UNESCO Global Geopark and Local Sustainable Development <b>Peng FENG</b>	
10:15-10:30	Geopark Education and Sustainable Development in Non Nuoc Cao Bang UNESCO Global Geopark <b>Thuy LY</b>	
10:30-10:45	Over-tourism; Concentration of Tourists at Nabegataki Geosite, Aso UGGp and the Ethical Utilization for Natural Resources <b>Koki NAGATA</b>	
10:45-11:00	Las Loras UGGp as a Tool for an Agro-Ecological Transition and Support for Local Produce <b>José Ángel SÁNCHEZ FABIÁN</b>	
11:00-11:15	New Activities for the Sustainable Development of the Geopark Karawanken Crossborder Region <b>Darja KOMAR</b>	
11:15-11:30	Developing Geopark Guide Training for Sustainable Tourism in Salpausselkä Geopark <b>Vilma-Lotta TALLGREN</b>	
11:30-11:45	Sustainable Tourism : Positioning and Developing a Green Identity <b>Alain PETIT</b>	

Moderator	<b>KIM Eun-Young</b>	<b>[201B, 2F]</b>
(GMT)		
12:00-12:15	<b>RURITAGE Project – Uniting Geoparks Around Rural Regeneration</b> <b>Irina PAVLOVA</b>	
12:15-12:30	<b>Applications of Geographical Information System-Databases to the Holistic Management of Origenes and Courel Mountains UNESCO Global Geoparks, Spain</b> <b>Daniel BALLESTEROS, Xavi MIR</b>	
12:30-12:45	<b>UNESCO Global Geoparks, Territories of Inclusion and Sustainability - Information Panels in the Aspiring Geopark Oeste</b> <b>Miguel REIS SILVA</b>	
12:45-13:00	<b>UNESCO Global Geoparks and the 2030 Agenda for Sustainable Development - The Perfect Marriage for a Better World</b> <b>Elizabeth SILVA</b>	
13:00-13:15	<b>M'Goun UNESCO Global Geopark as a Vector of Geo-Tourism and Socio-Economic Development</b> <b>Driss ACHBAL</b>	
13:15-13:30	<b>Joining Local-to-Global Initiatives, and Guiding the Geopark Through UN SDGs</b> <b>Leah BENETTI</b>	
13:30-13:45	<b>A Case Study of Housing Affordability and Vacation Rental Regulations in Niagara Falls, Canada</b> <b>Hannah WILLMS</b>	

## **MS06: Geoparks, Sustainable Tourism and Sustainable Local Development**

Moderator	<b>CHOI Taejin</b>	<b>[202A, 2F]</b>
(GMT)		
08:00-08:15	<b>Rural Tourism Fostered in Yandangshan UNESCO Global Geopark</b> <b>Qinfei LU</b>	
08:15-08:30	<b>The Discussion on Geotourism Development of Xiangxi Global Geopark Under the Influence of Pandemic</b> <b>Qingzi YE</b>	
08:30-08:45	<b>A Truly Madly Deeply Love in Batur: Implementation of Environmental Service Payment for Geoheritage and Community Welfare</b> <b>Eli Jamilah MIHARDJA (not attend)</b>	
08:45-09:00	<b>Collaboration of Tourism and Geopark – Geopark Visitor Center, Accommodation, Tourist Information and Local Guides</b> <b>Sawako ISHIHARA</b>	
09:00-09:15	<b>Geosite Conservation Within Development Area: Case Study in Lembah Kinta National Geopark, Malaysia</b> <b>Rapidah MAT STAFA</b>	
09:15-09:30	<b>Empirical Operation of Satun UNESCO Global Geopark of Thailand According to Sustainable Development Goals</b> <b>Fa-is JINDEWHA</b>	
09:30-09:45	<b>Geotourism for Community Engagement for Inclusive and Equitable Development</b> <b>Thùy VI TRAN</b>	

---

10:00-10:15	Integration of Culture and Tourism, Innovative Development - The "Tourism+" Effect of Yuntaishan UNESCO Global Geopark <b>Yutong ZHU</b>	
10:15-10:30	The Three Pilot - Batur UGG's Programs on Sustainable Development <b>I Gede Wiwin SUYASA</b>	
10:30-10:45	Same Roots, Same Origins: A Cultural Heritage Conservation Project for Sustainable Local Development <b>Yu Nam CHAN</b>	
10:45-11:00	Hot Springs Distribution for Geopark Development in Hulu Langat, Selangor, Malaysia <b>Mohd Hariri ARIFIN</b>	
11:00-11:15	Visitor Management and Awareness Rising in Styrian Eisenwurzen UNESCO Global Geopark <b>Oliver GULAS-WOEHRI</b>	
11:15-11:30	Super Cayrou : Contemporary Art, Know-how and Geology in the Geopark of the Causses du Quercy <b>Vincent BIOT</b>	
Moderator	<b>SOHN Youngkwan</b>	<b>[202A,2F]</b>
(GMT)		
12:00-12:15	Governance & Bottom - Up Approach for Sustainable Tourism and Local Development <b>Javier LÓPEZ CABALLERO</b> (not attend)	
12:15-12:30	Astronomic Tourism Initiative in the Granada Geopark <b>Myriam PRIETO</b>	
12:30-12:45	Estrela UNESCO Global Geopark: Tourism Strategy for the Development of Local Communities <b>Patrícia AZEVEDO</b>	
12:45-13:00	Estrela UNESCO Global Geopark: A Year of Classification <b>Emanuel DE CASTRO</b>	
13:00-13:15	Sustainable Tourism Strategies in the Burren and Cliffs of Moher UGGp <b>Carol GLEESON</b>	
13:15-13:30	Encouraging Social and Sustainable Entrepreneurship Through Geoproducts in Tourist Communities Integrated with UNESCO's Geopark Araripe World <b>Maria Juliana Ferreira LEITE, Francisca MENDONÇA</b>	
13:30-13:45	Tourism Innovation Transfer Programme for the Ecosystem of the UNESCO Global Geopark Kütralkura - Chile <b>Erika CECILIA</b> (not attend)	

---

## MS02: Aspiring Geoparks

Moderators	JEON Yongmun, JANG Kwangsub	[202B, 2F]
(GMT)		
08:00-08:15	Evolutionary Study and Global Comparative Analysis on Cone Karst in Xingyi Geopark Jichao PENG	
08:15-08:30	Researches and Suggestions to Actual Cases in Miné-Akiyoshidai Karst Plateau Geopark Manaka KAJIOKA	
08:30-08:45	Geoeeducating Students, Teachers, or Both? an Example from the Oeste Aspiring Geopark (Portugal) Nuno PIMENTEL	
08:45-09:00	An Area of International Significance for Geoconservation in the Central Anatolia: The Cappadocia Aspiring Geopark, Turkey Ahmet Serdar AYTAÇ	
09:00-09:15	Ida Madra Aspiring Geopark: 2021 UNESCO Geopark Candidate of Turkey Erdal GUMUS	
09:15-09:30	Kefalonia-Ithaca Aspiring Geopark Elena ZOUMPOULI	
10:00-10:15	Impact Crater Lake Geopark aUGGp Heikki MARTIKAINEN	
10:15-10:30	Aspiring Costa Quebrada UNESCO Global Geopark Project Gustavo GUTIERREZ	
10:30-10:45	The Aspiring Cotentin Geopark, a Geotouristic Destination to Built Jacques AVOINE	
10:45-11:00	The Joyce Country and Western Lakes Aspiring Geopark; Rich Geodiversity, Contrasting Landscapes, and Putting the Irish Language Front and Centre Benjamin THEBAUDEAU	
11:00-11:15	Intangible Cultural Heritage as an Economic Driver in Sustainable Tourism Darren RICE	
11:15-11:30	Building Continents and Societies Brynjar STAUTLAND	
Moderator	LEE Soojae	[202B, 2F]
(GMT)		
12:00-12:15	Description and Characterization of British Columbia's Fire & Ice Aspiring Geopark John RAE	
12:15-12:30	The Appalachian Geopark: An Aspiring Geopark from West Virginia, USA Robert BURNS	
12:30-12:45	Cajón Del Maipo (Chile): An Aspiring Geopark with World-Class Potential Camilo VERGARA DASKAM	
12:45-13:00	Where the World Meets - Description and Characterization of the Niagara Peninsula Aspiring Global Geopark Darren PLATAKIS	
13:00-13:15	Charlevoix Geopark's Geological and Astronomical Heritage Pierre VERPAELST (Presenter: Felicia CORBEIL)	
13:15-13:30	Susceptible Areas to Flash Flood and Debris Flow in Caminhos Dos Canions Do Sul Aspirant Geopark – South Brazil Maria Carolina Villaça GOMES (not attend)	
13:30-13:45	Celebrating the Origins of Animal Life: Building a UNESCO Global Geopark in Charnwood Forest, UK Jack MATTHEWS	

**December 15 (Wednesday)****MS04: Popularizing Scientific Knowledge for Public Education**

Moderators **JEONG Dai-yeun, Ibrahim KOMOO** [Halla, 3F]

(GMT)

- 08:00-08:15 Communicating Geopark Heritage and Activities to the Broad Public Using Social Networks. Lesvos Island UNESCO Global Geopark as a Case Study  
**Nickolas ZOUROS**
- 08:15-08:30 Lesvos Petrified Forest as a Tool for Climate Education in Lesvos Island UNESCO Global Geopark  
**Konstantina BENTANA**
- 08:30-08:45 Travelling Through a Pandemic: The GEOclimHOME-PRO Exchanges Continued During the Covid-19 Outbreak  
**Ilaria SELVAGGIO**
- 08:45-09:00 Sharing Heritage by Community; The Process of Community-based Documental Movie Making in Kauhajoki  
**Marketta NUMMIJÄRVI**
- 09:00-09:15 The Island of Biševo: Geoh heritage and Coexistence of Humans and Nature  
**Tvrtko KORBAR**
- 09:15-09:30 The Digitization of Cultural Heritage in the Idrija Geopark  
**Maša ČIBEJ**

**SS02: Management of Multi-Internationally Designated Areas**

Moderators **LEE Soojae, Patrick MCKEEVER** [Halla, 3F]

(GMT)

- 09:45-10:00 Integrated Management of Multi-Designations in Huangshan  
**Runze CHEN**
- 10:00-10:15 Synergetic Management of Multiple International Designations of Shennongjia  
**Jinxin CHEN**
- 10:15-10:30 Comprehensive Management in Territories Hosting Multiple UNESCO Designations: A Case from Yanqing UNESCO Global Geopark  
**Junbo WANG**
- 10:30-10:45 UNESCO Multi-Designations Integrated Management Plan - National Park of Cilento Vallo Di Diano and Alburni UGGp  
**Aniello ALOIA**
- 10:45-11:00 Geological World Heritage - A Revised Global Framework for the Application of Criterion (viii) of the World Heritage Convention and a Comparison with UNESCO Global Geoparks  
**Patrick MC KEEVER**

---

## MS01: Mature Geoparks—sharing Successes and Challenges

---

Moderators	<b>JOO Youngji, JANG Kwangsub</b>	<b>[201A, 2F]</b>
(GMT)		
08:00-08:15	Review of the 10th Anniversary of Tianzhushan UNESCO Global Geopark <b>Wen HUANG</b>	
08:15-08:30	Discussion on the Value of Monogenetic Volcanic Area Under Unique Intracontinental Tectonic Background of Wudalianchi UGGp <b>Jiabo ZHANG</b>	
08:30-08:45	Measures Implemented for Containing the Spread of COVID-19 in Zhangjiajie UGGp of China and the Adjacent Areas <b>Yiheng ZHOU</b>	
08:45-09:00	New Research Activities Using Marine Plastic Debris on the Coastal Geosites, the Nanki Kumano Geopark, Japan <b>Wataru AZUMA</b>	
09:00-09:15	Geo Art: Let's Make Stone Faces <b>Takahiko OGAWARA, Theodore BROWN</b>	
09:15-09:30	The (E)Valuation of Geosites in the UNESCO Global Geopark TERRA.vita <b>Tobias FISCHER</b>	
Moderators	<b>JOO Youngji, Kristin RANGNES</b>	<b>[201A, 2F]</b>
(GMT)		
09:45-10:00	Rebranding a Mature Geopark – From Marble Arch Caves to Cuilcagh Lakelands - A Collaborative Approach <b>Gráinne O CONNOR</b>	
10:00-10:15	AUGGN New Structure to Promote the Geopark Concept in Africa <b>Driss ACHBAL</b>	
10:15-10:30	The Larvikite: A Unique Rock – Perfect for Communication but at the Same Time a Huge Industry Inside Gea Norvegica UGGp <b>Kristin RANGNES</b>	
10:30-10:45	Geologist and Scientist for a Day: An Educational Program During the Pandemic <b>Vegard LUND</b>	
10:45-11:00	The Media as Important Resources for the Recognition of Our Heritage: Araripe Geopark <b>Michel MARQUES</b>	
11:00-11:15	Smart, Sustainable and Inclusive Management of 516 Arouca (Arouca UNESCO Global Geopark – Portugal) <b>Verónica BERNARDO</b>	

---

## MS06: Geoparks, Sustainable Tourism and Sustainable Local Development

Moderators	<b>SOHN Youngkwan, Martina PASKOVA</b>	<b>[201B, 2F]</b>
(GMT)		
08:00-08:15	Mt Chelmos: The Rocks, the Mountain and the Myths as a Tool for Sustainable Development! Penelope PAPADOPOULOU	
08:15-08:30	Insular and Coastal Geoparks as Ideal Sustainable Tourism Destinations Emmanouil ANTONAKIS	
08:30-08:45	New Interactive Exhibition on the Diverse Volcanic Heritage of Bakony-Balaton UNESCO Global Geopark, Hungary Barnabas KORBELY	
08:45-09:00	Geotourism Strategy in Portuguese UNESCO Global Geoparks Joana RODRIGUES	
09:00-09:15	The Development of the Idrija Selected Collective Trademark in the Idrija UNESCO Global Geopark Urška BAJEC RUPNIK	
09:15-09:30	Digital Tools in COVID Times to Promote Sustainable Development at Psiloritis UGGp, Greece Charalampos FASSOULAS	

Moderator	<b>SOHN Youngkwan</b>	<b>[201B, 2F]</b>
(GMT)		
09:45-10:00	Integration of Culture and Geotourism in Longhushan UNESCO Global Geopark Jieting FAN	
10:00-10:15	Djerdap UNESCO Global Geopark Jovana MARINKOVIĆ	
10:15-10:30	The Geoconservation Project Along the Maroullena Riverbed is the Result of an Ideal Collaboration Between the Geopark Team, Local Community and Government Departments Efthymios TSIOLAKIS	

## MS05: Conservation, Science and Research

Moderators	<b>Darren SOUTHCOTT, Jianping ZHANG</b>	<b>[202A, 2F]</b>
(GMT)		
08:00-08:15	Conservation of Heritage Values in Non Nuoc Cao Bang Geopark Territory Hieu DUONG	
08:15-08:30	Discussion on Internet + Geotourism Under the Epidemic Chengong ZHANG	
08:30-08:45	Research on Biodiversity and Protection Strategy of Mount Cangshan in Dali Xiaokang HU	
08:45-09:00	Tangible and Intangible Culture Diversity; Preservation and Education Ciletuh Palabuhanratu UGGp Saprudin SAPRUDIN	
09:00-09:15	Fossil Research in the Burren and Cliffs of Moher UGGp Eamon DOYLE	
09:15-09:30	Tectonic Setting of the Hisaralan Geothermal Travertine Chimneys of the Aspiring Ida Madra Geopark (Turkey) Inan ULUSOY	

Moderators	<b>Darren SOUTHCOT, Helga CHULEPIN</b>	<b>[202A, 2F]</b>
(GMT) 09:45-10:00	The Paleozoic Ichnofacies of Bagnoles de l'Orne (Normandy Maine Aspiring Geopark): A Study for Their Integration Within a Geological Nature Reserve <b>Jacques AVOINE</b>	
10:00-10:15	On the Fossil Footprints of the Luberon UNESCO Global Geopark: The Saignon Fossil Tracksite (Vaucluse, France) <b>Pauline COSTER</b>	
10:15-10:30	Systematic Literature Review of Geographic Information Systems Application on UNESCO Global Geopark <b>Emmaline ROSADO-GONZÁLEZ</b>	
10:30-10:45	Mineral Resources in UNESCO Global Geoparks in Latin America and the Caribbean <b>Helga CHULEPIN</b>	
10:45-11:00	The Maiella UNESCO Global Geopark, a Journey Through Its Geodiversity and Sustainable Development Research Program <b>Adele GARZARELLA</b>	

## MS02: Aspiring Geoparks

Moderator	<b>LEE Sung-rock</b>	<b>[202B, 2F]</b>
(GMT) 08:00-08:15	Geological Landscapes and Their Formation and Evolution of Wugongshan Geopark, China <b>Lichao YANG</b>	
08:15-08:30	Living Landscape in the Ruins of the Caledonides in the Fjord Coast Regional - and Geopark <b>Alice VIE</b>	
08:30-08:45	Napo Sumaco Aspiring UNESCO Global Geopark (Ecuador): Activities and Consolidation <b>Jose Luis SANCHEZ CORTEZ</b>	
08:45-09:00	The Aspiring UNESCO Global Geopark Mëllerdall, Grand-Duchy of Luxembourg <b>Birgit KAUSCH</b>	
09:00-09:15	The Influence of Salpausselkä Formations on the Settlement in the Region of Päijät-Häme <b>Eeva AARREVAARA, Paul CARROLL</b>	
09:15-09:30	Scientific Interpretation of Longyan Aspiring Global Geopark, Fujian, China <b>Yuanyuan ZHENG</b>	

## Workshop on Education

---

Moderators **Marie-Luise FREY, José M<sup>a</sup> BARRERA, Naomi FOSTER, Cristian CIOBANU**

---

(GMT)

09:00-11:00

How We Started Working on #ESDfor 2030  
**José M<sup>a</sup> BARRERA**

SDG-Geocache Project to Promote Agenda 2030 Regionally  
**Sandra TEUBER**

Example of Online Youth Workshops  
**Naomi FOSTER**

Volunteers for the Geopark. Hybrid Educational Activities During the Pandemic  
**Cristian CIOBANU**

Geoeducation During the Lockdown – the Case Study from the Center of Geoeducation, Holy Cross Mts. UGGp, Poland  
**Witold WESOLOWSKI**

Geological Times Step by Step  
**Clément CAZÉ**

TeahOUT – A Mobile Application for Educational Activities in UNESCO Global Geoparks  
**Nina ERJAVEC**

Escape Later, Learn Now: A Digital Escape Room about the Geopark's Heritage  
**Iván CORTIJO**

Educational Online Games: Connecting with the Geopark  
**Luis MAMPEL**

---

**December 16 (Thursday)****MS03: Regional and International UNESCO Global Geopark Collaborations**

Moderators **YOON Seokhoon, Marie FREY LUISE** [202B, 2F]

(GMT)

- 08:00-08:15 The 'World Research Travel Organization' - A Potential Partner of UNESCO Global Geoparks  
**Wolfgang EDER**
- 08:15-08:30 How to Continue Longer Term Geopark Cooperation During Pandemic Time  
**Tao HUANG**
- 08:30-08:45 Geoparks Youth Hub: A Digital Platform to Connect Youth Globally for Geopark Sustainability  
**Kaisar AKHIR**
- 08:45-09:00 The Spirit of 'Gotong Royong' for Youth in Developing Indonesian Geopark  
**Eli Jamilah MIHARDJA, Togu PARDEDE, Immanuel SILALAH**
- 09:00-09:15 Progress and Challenges of the Geoparks Network of Latin America and the Caribbean GEOLAC. Strengthening the Construction of Way for Sustainability and Inclusion in Latin America and the Caribbean  
**José Patricio Pereira MELO**
- 09:15-09:30 How Global Geoparks Can Support Decolonization and Raise Indigenous Voices: Lessons from the Canadian Experience  
**John CALDER**

Moderators **YOON Seokhoon, Enas AHMED** [202B, 2F]

(GMT)

- 09:45-10:00 Ecuadorian Committee of Geoparks (CEG): Path Toward the Conservation and Sustainable Use of the Geological Heritage of Ecuador  
**Jose Luis SANCHEZ CORTEZ**
- 10:00-10:15 Bergstrasse-Odenwald UNESCO Global Geopark (Germany): Cooperation Inside the Territory and Across the Continents Under Pandemic Conditions – Examples and Experiences  
**Jutta WEBER**
- 10:15-10:30 GEOfood as an Education, Research and Tourism Initiative  
**Sara GENTILINI**
- 10:30-10:45 Geopark Networking and Collaboration and COVID-19  
**Sigurður SIGURSVEINSSON**
- 10:45-11:00 The Value of Partnerships in UNESCO Global Geoparks of Latin America and Caribbean: Supporting the Sustainable Development Goals  
**Emmaline ROSADO-GONZÁLEZ**
- 11:00-11:15 Stone Made Objects – The Traveling Exhibition to Promote Intangible Heritage of UNESCO Global Geoparks  
**Alexandru ANDRASANU**

## MS01: Mature Geoparks—sharing Successes and Challenges

Moderators	<b>HUH Min, Asfawossen ASRAT</b>	<b>[201A, 2F]</b>
(GMT)		
08:00-08:15	The Success of Huanggang Dabieshan UNESCO Global Geopark and the Challenges It Faces <b>Di WU</b>	
08:15-08:30	Management Measures and Effectiveness Analysis of Yuntaishan Global Geopark Under Natural Disasters <b>Xia LI</b>	
08:30-08:45	Oki Islands Geopark Museum: Exciting New Facility for Visitors and Residents <b>Ryosuke IKENAGA</b>	
08:45-09:00	Citizen Movements for Conserving of the Mudeungsan UGGp <b>HUH Min</b>	
09:00-09:15	An Integrated Geoproduct Development for Geotourism in Langkawi UNESCO Global Geopark, Malaysia : A Case Study of the Kubang Badak Biogeotrail <b>Norhayati AHMAD</b>	
09:15-09:30	Kütralkura UNESCO Global Geopark: Challenges of Municipal Association for Inclusive and Sustainable Rural Territorial Management in a Process of Extension <b>Patricia HERRERA</b>	
Moderators	<b>HUH Min, Tim BADMAN</b>	<b>[201A, 2F]</b>
(GMT)		
09:45-10:00	Educational Services of the Arouca UNESCO Global Geopark (Portugal) – Challenges in the Context of COVID-19 Pandemic <b>Alexandra PAZ</b>	
10:00-10:15	Recent Activities of Kula-Salihli UNESCO Global Geopark <b>Tuncer DEMIR</b>	
10:15-10:30	The Impact of COVID-19 on Visitor and Information Centres in UNESCO Designated Sites in Europe <b>Cristian CIOBANU</b>	
10:30-10:45	University-Based Projects for Sustainable Development in Hateg Country UGGp Romania <b>Alexandru ANDRASANU</b>	
10:45-11:00	The Management of Upper Idrija Landscape Park as a Protected Area Within the Idrija UNESCO Global Geopark <b>Mojca GORJUP KAVCIC</b>	

---

## MS07: Geoparks, Climate Change and Geo-hazards

---

Moderators **LEE Yong-II, Xiaochi JIN** [201B, 2F]

---

(GMT)

- 08:00-08:15 Community-Based Adaptation Strategies to Climate Change in Muroto UNESCO Global Geopark, Japan  
**Akifumi NAKAMURA**
- 08:15-08:30 Human-Induced Hazard vs. Natural Hazard: Microplastics and Volcanic Pumice Drifting in the Sea  
**Setsuya NAKADA**
- 08:30-08:45 Naturtejo UNESCO Global Geopark (Portugal) Contribution to Wildfire Risk Reduction  
**Joana RODRIGUES**
- 08:45-09:00 The Role of Local Governments in Responding to Climate Crisis  
**Furzannie HANNA**
- 09:00-09:15 Indigenous Knowledge of Tay Ethnic Group in the Lang Son Aspiring UNESCO Global Geopark and Implication for Climate Change Adaptation  
**Huong PHAM**
- 09:15-09:30 Strategies for Tackling Climate Change in the Burren and Cliffs of Moher UGGP  
**Eamon DOYLE**
- 

Moderators **LEE Yong-II, Kirstin LEMON** [201B, 2F]

---

(GMT)

- 09:45-10:00 Plio-Pleistocene Climate and Sea Level Change in the English Riviera UNESCO Global Geopark  
**Malcolm HART**
- 10:00-10:15 UNESCO Global Geoparks in the UK: Fighting Against Climate Change  
**Kirstin LEMON**
- 10:15-10:30 Using Active Faults as Educational Tools on Natural Hazard and Disaster Mitigation. Western Lesvos Island as a Case Study  
**Aggelos LAMPRAKOPOULOS**
- 10:30-10:45 Rumble and Tremble, an Educational Exhibition to Promote Earthquake Awareness in the Apuan Alps UGGP (Italy)  
**Alessia AMORFINI**
- 10:45-11:00 Researching and Educational Activity on Climate Change in Yangan-Tau UNESCO Global Geopark  
**Ekaterina BOGDAN**
- 11:00-11:15 The Green Geopark's Museum: A Climate Change Adaptation Case Study  
**Ilias VALIAKOS**
- 11:15-11:30 Remains of the Kumamoto Earthquake in Aso Caldera and Utilization for Educational Program, Aso UGGP  
**Takayuki KUBO**
-

**MS05: Conservation, Science and Research**

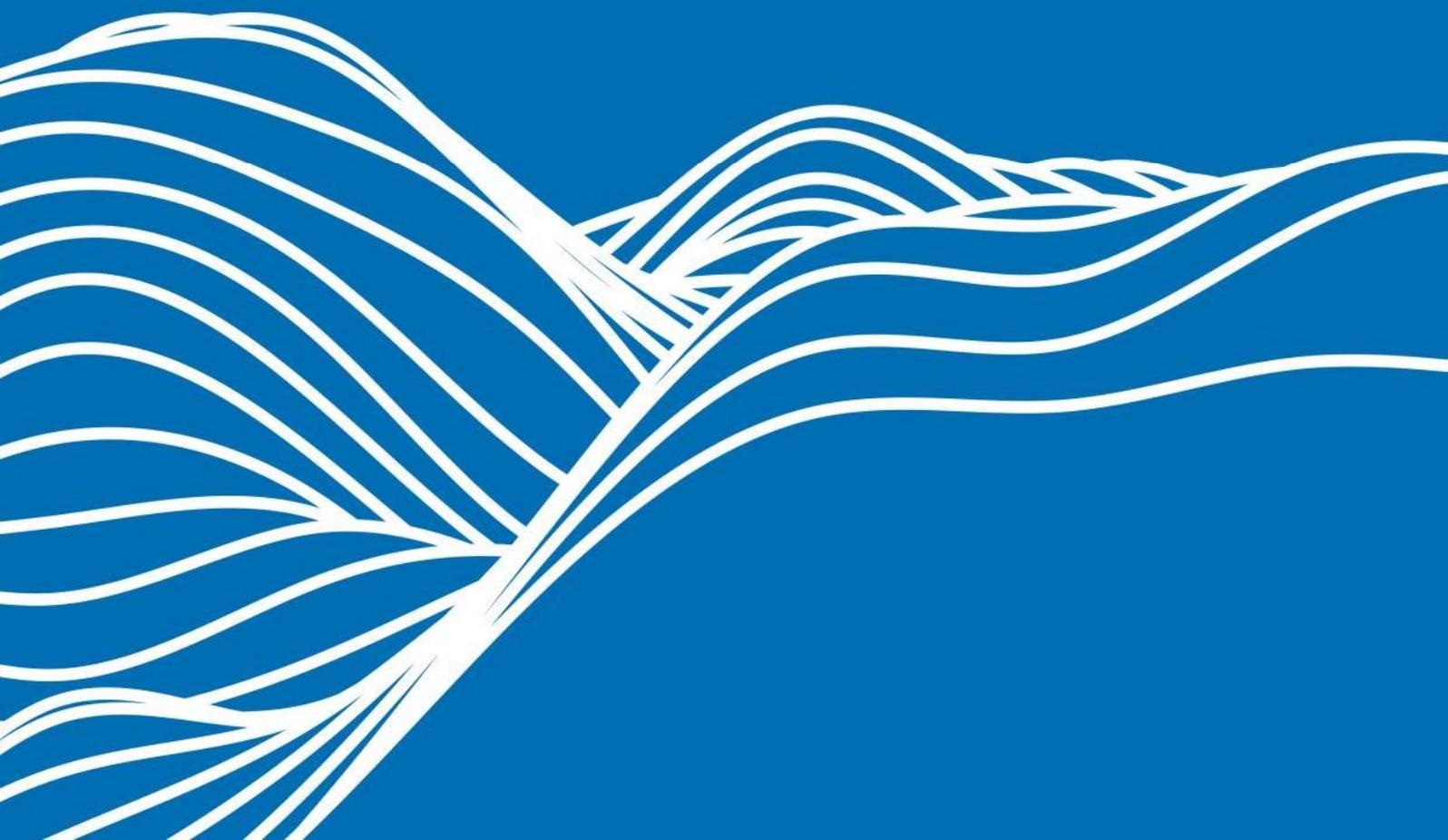
---

Moderators	<b>LEE Sung-rock, Melanie BORDER</b>	<b>[202A, 2F]</b>
(GMT)		
08:00-08:15	Spatial Characteristics and Controls on Landscape Evolution in Zhangjiajie UGGp of China <b>He-qing HUANG</b>	
08:15-08:30	Global Geosite (CB010) - Costa Quebrada and Liencres Dune Field: A Geomorphic Evolution Model for a Retreating Coast (Cantabria, Northern Spain) <b>Viola Maria BRUSCHI</b>	
08:30-08:45	The Virtues of Promoting Research for Strengthening the Values of a Geopark: The Case of Glacial Geomorphology at the Estrela UGGp, Portugal <b>Goncalo VIEIRA</b>	
08:45-09:00	Joint Actions in Internationally Designated Areas Within the Territory of the Oeste Aspiring Geopark, Portugal <b>Alline DIAS</b>	
09:00-09:15	Imbabura UNESCO Geopark: A Mine of Knowledge to Young Researchers <b>Patricia RENGEL</b>	
09:15-09:30	A Digital Approach to Geoconservation Inventorying in the Wellington Park, Tasmania <b>Mark WILLIAMS</b>	
09:30-09:45	Scale Issues for UAV 3D Mapping: The Case of Lesvos Geopark <b>Ermioni Eirini PAPADOPOULOU</b>	

---

DIGITAL 9<sup>th</sup> International Conference  
on UNESCO Global Geoparks

# Oral Abstracts





---

# DAY 1

December 14

---





## Design Conception and Educational Function of Huanggang Dabieshan UNESCO Global Geopark Museum

Mengting CHEN<sup>1\*</sup>,  
China University of Geosciences<sup>1</sup> China

A geopark museum with regional characteristics is a necessary hardware facility for any UNESCO global geopark. The museum can be a source of attraction for visitors because it provides an easy and direct way to know the geopark. Visitors can be more interested in exploring the real world presented by the museum. The influx of large numbers of tourists will promote the development of regional tourism and economic industry. While doing a good job in pavilion design, the geopark museum should give full play to social educational function and enhance the public awareness of ecological protection.

**Keywords:** museum, exhibition, pavilion design, public education

**Corresponding author:** chenmt93@foxmail.com

**Reference:**

- [1] Fan Luwei, Li Fuqiang. The Evolution Role of Museum Audiences in New Age: A Case Study on the Exhibition of Who Decides ?[J]. Journal of Natural Science Museum Research, 2019(4):8. [2] Zhou Jiahui, Xu Lei, Liu Nan, Gu Jieyan, Wang Yu. The application of Virtual Reality in science education: A case study of the insect VR video series in Shanghai Natural History Museum[J]. Science Education and Museums, 2019,5(03):208-213. [3] Song Xian, Jin Yinglian. Social Inclusion in the Education Program of European and American Museums: Concepts and Practices[J]. Primary & Secondary Schooling Abroad, 2018(08):24-29. [4] 彭艳菊,周艳,何哲峰. 我国地学类博物馆科普现状分析[J].地质评论, 2015,61(S1):860-861. [5] 杨桂芳. 欧洲地质公园科普分析与国内借鉴[C]. 中国科普理论与实践探索——全国科普理论研讨会, 2014. [6] Geng Yuhuan, Wang Jing. Research on Earth Science Popularization of Geopark Museum: Status and Its Enlightenment[J]. Journal of Anhui Agricultural Sciences, 2013,41(14):6365-6367. [7] He Xiaoqian, Li Chaonan, Xu Jijia. The features of tourists perception of popular science education in Mount Longhu global Geopark[J]. Journal of Arid Land Resources and Environment, 2018,32(08):202-208. [8] Reis J, L Póvoas, Barriga F, et al. Science Education in a Museum: Enhancing Earth Sciences Literacy as a Way to Enhance Public Awareness of Geological Heritage[J]. Geoheritage, 2014, 6(3):217-223.

## The Achievements of Science Popularization in Longyan Aspiring Global Geopark

*Wensheng LIN<sup>†\*</sup>,  
Longyan Aspiring Global Geopark<sup>1</sup> China*

In order to popularize the general knowledge of geosciences for the public, establish the concept of protecting geo-heritages and make the public understand, support and participate in the establishment of Longyan UNESCO Global Geopark, Longyan Aspiring Global Geopark has taken various measures to strengthen science popularization work: firstly, strengthening the infrastructure construction; secondly, enriching the content of science popularization education; thirdly, actively carrying out science popularization activities. In these ways, we are trying to enhance the public's understanding of geosciences and strengthen their awareness of protecting nature so as to better achieve the harmonious coexistence of man and nature.

**Keywords:** Longyan, Geopark, achievement, science popularizations, education

**Corresponding author:** lysdzgysyb@163.com

**Reference:**

## School Program at Langkawi UNESCO Global Geopark

*Tanot UNJAH<sup>1\*</sup>, Sharina ABDUL HALIM<sup>1</sup>, Norhayati AHMAD<sup>1</sup>,  
Langkawi Research Centre<sup>1</sup> Malaysia, Langkawi Research Centre<sup>1</sup> Malaysia, Langkawi Research Centre<sup>1</sup> Malaysia*

This is a school program as part of popularizing scientific knowledge for public education initiated by the Langkawi Research Centre (LRC) as scientific support to Langkawi UNESCO Global Geopark (LUGGp). The program took approximately 14 years from prior to the establishment of LUGGp and throughout three times evaluation. This is a review of various forms of school programs conducted to primary and secondary schools at LUGGp. There are three main stages of conducting a program at school depending on the stage of geopark development. The first stage is the introduction, mainly a series of awareness programs to various schools in form of talks, exhibitions and simple scientific activities. Sometimes it is also conducted at the research centre as part of the introduction to the facilities. At this stage, some few schools begin to show their interest to be our partner. The second stage is toward the teachers, education department at Langkawi District, it also includes identifying an adopted school for continuous knowledge impartation and school involvement. At the third level, several schools are already known about our activity and even invite us to school for their program or assist them with environmental as geopark program. They also initiate several topics that can enrich the student learning experience or support the teaching curriculum. The process might be repeating itself due to some changes in teachers in changes or some focus of interest by the school management. Understanding this process also prepare us to provide the best for different school according to their need at their awareness stage.

**Keywords:** School program, popularizing scientific knowledge, Langkawi UNESCO Global Geopark, Malaysia

**Corresponding author:** tanot-u@ukm.edu.my

**Reference:**

Chitty, G. (ed.) 2017. Heritage conservation and communities: Engagement, participation and capacity-building. Routledge. Leman, Mohd Shafeea, Komoo, Ibrahim, Mohamed Kamal Roslan, Ali, Che Aziz & Unjah, Tanot. 2007. Geopark as an answer to geoheritage conservation in Malaysia- The Langkawi Geopark case study. Geological Society of Malaysia, Bulletin 53, 95-102. Rubén Fernández Álvarez. 2020. Geoparks and Education: UNESCO Global Geopark Villuercas-Ibores-Jara as a Case Study in Spain. Geosciences 2020, 10(1), 27; <https://doi.org/10.3390/geosciences10010027> Tanot Unjah, Norhayati Ahmad & Sharina Abdul Halim.2017. Communicating geopark through summer course programme to non-science student: case study of sustainable tropical heritage 2017 International Geopark Conference in Taiwan

## Suggestion to Effective Ways to Observe Outcrops for Enhancing Visitor's Geological Interests in Muroto UNESCO Global Geopark, JAPAN

Yoshihiro KAKIZAKI<sup>1\*</sup>, Akifumi NAKAMURA<sup>1</sup>, Tsubasa OGASAWARA<sup>1</sup>,  
Muroto Geopark Promotion Committee<sup>1</sup> Japan, Muroto Geopark Promotion Committee<sup>1</sup> Japan,  
Muroto Geopark Promotion Committee<sup>1</sup> Japan

This presentation suggests several effective ways to observe outcrop for enhancing visitors interests in geology in Muroto UNESCO Global Geopark (MUGP, hereafter). 1) Utilizing magnetic rock: gabbro with strong magnetism is easily found in Cape Muroto, one of the popular sites for visitors. The land of Cape Muroto is mainly composed of sedimentary rocks which is not magnetic very much. During a guided tour at Cape Muroto, a guide asks visitors to use a magnet to find a particular rock which is actually gabbro. It will make visitors, especially children, observe rocks very closely with strong curiosity. Magnetic rocks are deeply related to rock types and its formation processes. Visitors can learn differences of rocks with and without magnetism through their experiences. 2) Showing simple chemical experiment: calcite, intruding into igneous rocks, found at Cape Muroto. Calcite reacts with hydrochloric acid and it makes foam which causes visitors curiosity with surprise. Geologists or guides will give a brief explanation for visitors about composing materials of calcite to tell them a reason for the chemical reaction. 3) Striking stones each other: harder rocks often make topographic high due to differential erosion. Gabbro at Cape Muroto is harder than sedimentary rocks and resistant to erosion. Visitors, therefore, can observe very clearly aligned huge gabbro rocks, standing on exposure range of gabbroic sheet. It shows that rock hardness influences on topography. Those rock characteristics (magnetism, chemical reaction, and hardness) are visualized by each different way mentioned above. MUGP develops various ways to observe outcrops to enhance visitor's awareness and interests in geology as one of ways of science popularization.

**Keywords:** science popularization, outcrop observation, field guide

**Corresponding author:** [ykakizaki@muroto-geo.jp](mailto:ykakizaki@muroto-geo.jp)

**Reference:**

Nakamura, Y., Yuhora, K., 2018. Muroto Geopark: Understanding the Moving Earth. In: Chakraborty, A., Mokudai, K., Cooper, M., Watanabe, M., Chakraborty, S. (Eds.) Natural Heritage of Japan. Geological, Geomorphological, and Ecological Aspects. Springer, Cham, Switzerland, pp. 103–116.

## Fostering a Key Competence for Sustainability through Geopark education as ESD

Ryuta YAMAMOTO<sup>1\*</sup>,  
Shizuoka Univ.<sup>1</sup> Japan

Competence is recognized nowadays as one of the most influenced educational concepts about the student's ability and capability which should be fostered through school and life-long education. In the context of Education for Sustainable Development (ESD) UNESCO emphasis on Key competencies for Sustainability, which is based on the Wiek's competencies model and above all, the first competence is systems thinking competency. This competence is to recognize and understand relationships in real field and to analyze and evaluate the complexity of the real world for dealing with problems and making the world sustainable. The Japanese Geoparks Network has the working group for education, and it developed Geopark-specified learning perspective as Geo-Ecology-Human systems model. This model is to foster students' systems thinking competence and has been implemented in learning material and field work education as well as the subject education at school such as geography and geology. This learning style is more directed to the inquiry learning which means students collect data in field, analyze and present them in oral or poster presentation as a research result. However, this learning activity's complexity is too high to deal with Geo-phenomena in Geoparks. Besides the teachers are not well enough trained because the school subjects, geography and geology are not compulsory subject for a long time and the inquiry learning is installed in the recent revision of the national curriculum. So, I introduced a learning method "Mystery" in Geopark education. The Mystery is born in England at the end of 1990's and came to Japan via Netherlands and Germany. In Germany, The Mystery's interpretation has been switched to foster the Systems thinking competence. The Mystery could be accepted in the school education in Geopark because The Mystery offers the active learning which is the educational trend in Japan and fostering systems thinking competence through thinking of Geo-Ecology-Human model in Geopark.

**Keywords:** Education, Key competence for Sustainability, Education for Sustainable Development, Mystery, Japan

**Corresponding author:** yamamoto.ryuta@shizuoka.ac.jp

**Reference:**

<https://doi.org/10.1007/s11625-011-0132-6>

## Innovative Practice of Science Popularization in Danxiashan UNESCO Global Geopark

Guiqing LI<sup>1\*</sup>, Fang CHEN<sup>2</sup>, Yidong MA<sup>2</sup>, Wei XIAO<sup>2</sup>,

*School of Tourism Management, South China Normal University; Danxiashan UNESCO Global Geopark<sup>1</sup> China, Danxiashan UNESCO Global Geopark<sup>2</sup> China, Danxiashan UNESCO Global Geopark<sup>2</sup> China, Danxiashan UNESCO Global Geopark<sup>2</sup> China*

Danxiashan UGGp has been developing and promoting science popularization since it became one of the first UNESCO Global Geoparks. The Geopark has formed an innovative model of science popularization, with a strategy of "promoting sustainable development of local communities by science popularization", targeting at managers, community residents, tourists, students and the public. A large number of brand activities have been developed, including "Danxiashan-Spectacular nature in the world" Book Crossing. The model has received the supports from universities and research institutions and has made periodic achievements. First, it has broadened the target group, which covers managers, community residents and the public. Second, the local tourism industry has been upgraded due to the development of science popularization tourism and field study trips. Third, through receiving science education, the local residents have obtained economic, psychological and social empowerment, gained more diversified means of livelihood, and enhanced their sense of local identity and contentment.

**Keywords:** Geopark, Science Popularization, Danxiashan UGGp, China

**Corresponding author:** 1845463522@qq.com

**Reference:**

## The Discovery of Megalodon Fossils (Giant Sharks) in The Ciletuh Palabuhanratu Geopark, Raises Public Awareness for Conservation and Education Activities

*Mega Fatimah ROSANA<sup>1\*</sup>, Santi Dwi PRATIWI<sup>1</sup>, Winantris WINANTRIS<sup>1</sup>,  
UNIVERSITAS PADJADJARAN<sup>1</sup> Indonesia, Universitas Padjadjaran<sup>1</sup> Indonesia, Universitas Padjadjaran<sup>1</sup> Indonesia*

The Ciletuh Palabuhanratu Geopark, located in Sukabumi district, West Java, Indonesia, was designated as UNESCO global geopark in April 2018. Until now, the geopark is used for educational, conservation and sustainable economic development activities. Besides that, this geopark area is also an area for various research activities from various universities in Indonesia. Research in the field of geology also continues to be carried out to reveal various geological phenomena that have not been studied. Recently, in Gunung Sungging Village, the community found some parts of megalodon (giant shark) fossils, especially shark teeth. The findings were then followed up through a detailed survey by the geological museum. During survey, they found various other fossils in the Cibodas Formation that consisting of limestone, sandy limestone and carbonated sandstone inserts, as well as tuffaceous sandstone. The Cibodas Formation is Late Miocene and shows a marine depositional environment at a depth of up to 100m. This finding has a positive impact on the local community, through community education and empowerment programs. Thus increasing the public's sense of concern for conserving the locations of these fossil findings. The community participated in collecting fossil finds from the area around their village, and with the help of the geology museum, they built a small museum about megalodon in the village. The existence of the museum makes this area a new tourist destination in the geopark area, thus starting to grow the economy for the community through public tourism visits and educational tours.

**Keywords:** Ciletuh Palabuhanratu, Geoparks, Megalodon, Gunung Sungging, Cibodas Formation

**Corresponding author:** mega.fatimah.rosana@unpad.ac.id

**Reference:**

## The Tumbler Ridge “Health in Geoparks” project

*Charles HELM<sup>1\*</sup>, Scientific Advisor, Tumbler Ridge UNESCO Global Geopark,<sup>1</sup>  
Manda MAGGS<sup>2</sup>, Executive Director, Tumbler Ridge UNESCO Global Geopark<sup>1</sup>*

“Health and Well Being in Global Geopark Communities” was the main conference theme at the 7th International Conference on UNESCO Global Geoparks, held in 2016. This confirmed the potentially pivotal role of Global Geoparks in promoting wellness and healthy living, from which resulting awareness may lead to a healthier planet through addressing prevalent conditions such as Nature Deficit Disorder. In the Tumbler Ridge UNESCO Global Geopark in western Canada, we have developed a ‘Health in Geoparks’ project, using our combination of medical and geological expertise. With input from an array of health professionals, indigenous leaders, psychologists, archaeologists, geologists and athletes, we have developed four fully referenced modules, entitled ‘Move Well’, ‘Eat Well’, ‘Connect Well’, and ‘Live Well’. These are based on a combination of evidence-based evolutionary biology, indigenous wisdom, and healthy lifestyle choices and physical activities within our Global Geopark. Furthermore, we have developed a Teacher Resource Guide for schools, entitled “Living Well in Place: Health & Wellness in the Tumbler Ridge UNESCO Global Geopark, Structured around four easily accessible geosites, it can readily be incorporated into the school curriculum. Recent completion of these initiatives means we are ready to share them locally, regionally, nationally through the Canadian Geoparks Network, and internationally through the UNESCO Global Geoparks Network, in the hope that the underlying principles and themes can be used as a blueprint, and applied by all Global Geoparks, and hence have a positive global effect. Our goal is thus to create a link, through appropriate messaging and resources, between UNESCO Global Geoparks and healthy living through healthy physical activity, healthy eating patterns, connections to the natural environment, and awareness of our geological, palaeontological and archaeological heritage. We hope that as a result UNESCO Global Geoparks can have a positive effect on both human health and planetary health.

**Keywords:** health, wellness, Global Geoparks, geosites, educational modules

**Corresponding author:** helm.c.w@gmail.com, manda.maggs@tumbleridgegeopark.ca

**Reference:**

## Using Virtual Tools to Help Schoolteachers with Geology Education

*Max DECK-LÉGER<sup>1\*</sup>,  
Percé UNESCO Global Geopark<sup>1</sup> Canada*

The Percé UNESCO Global Geopark has helped teachers in over 45 classrooms in Quebec and New Brunswick. We have partnered with an organization called "Écoles en Réseau" (Networked Schools), which was created by the Ministry of Education in order to offer access to scientists to schools in Quebec and other french-speaking communities. The Percé Geopark helped develop experiments to be done in class, and the results of the experiment were sent to us. We then organized virtual meeting with several different classes at once to discuss the results and answer questions. The classes are from ages 6 to 11. One activity that we proposed was to go out and collect rock samples, to then try and sort them into different categories. Since no directives were given on how to sort the rock samples, every group chose different criteria for sorting the rocks. We then explained that in science, we always try to use the same criteria for sorting out the rocks, so that every scientist around the world can easily compare their results. The next activity we had them do is to make their own "rock cookies", in which student would use different ingredients to make their own rock (oats, marshmallows, chocolate chips etc.). We explained that the ingredients represented the different minerals within a rock. We also explained that the heat from their hands and the pressure applied helped the ingredients together, just like in nature where pressure and temperature can turn sediments into conglomerates. At the end of the presentation, I showed pictures of the cliffs near Percé, and explained to them why we see different colors (different geological formations) and how the sedimentary rock layers were formed and why they are now vertical (such as in the case of the Percé Rock). I also talked about the natural erosion of the rock cliffs, the different factors causing erosion and how inhabitants of Percé deal with this phenomenon. The advantages of such activities are, among others, the acquisition of increased digital skills among teachers and students, raising student motivation, retaining teachers and breaking professional isolation, and enriching students' experiences in the classroom. The students in the classroom were in front of the camera, and had the presentation projected in front of the class. They could therefore raise their hand to answer a question, or ask me a question. This made the activity highly interactive and appreciated by both the teachers and the students. We plan on doing more of these activities in the future, and maybe some day offer the activity in English Canada and maybe some day internationally. The virtual tools that we have can be used to reach more schools who do not have access to professional workshops in fields such as geology, environment and other important fields of science. It is also a great occasion to advertise our mission of conserving and enhancing the value of areas of geological significance in earth history.

**Keywords:** Education, Geology, Youth, Virtual tools

**Corresponding author:** scienceseteducation@geoparcdeperce.com

**Reference:**

[https://eer.qc.ca/document/1625078018840/planification-eer-2021-2022-primaire\\_vf30juin.pdf](https://eer.qc.ca/document/1625078018840/planification-eer-2021-2022-primaire_vf30juin.pdf)

## Innovative learning methodologies and digital inclusion for the promotion of Geoparks and sustainability

*Cristina PETRACCHI<sup>1\*</sup>, Sara GENTILINI<sup>2</sup>,  
FAO<sup>1</sup> Italy, Magma Geopark<sup>2</sup> Norway*

The FAO eLearning Academy supports the UNESCO Geoparks community and worldwide networks in the acquisition of multi- and transdisciplinary competencies, that are required for the sustainable management of Geoparks. The FAO e-learning Academy offers over 400 multilinguals certified eLearning courses, free of charge, as a global public good and is the result of a collaborative effort involving over 200 partners throughout the world. The overall objective of the FAO eLearning Academy is to strengthen the human capital, through the transfer of knowledge, skills and competences, in order to generate competent professionals able to face the global challenges, including those related to the sustainable management of Geoparks. The FAO eLearning Academy has now reached a global audience of over 700,000 users, the courses cover various thematic areas: water efficiency and management, soils management and restoration, climate smart agriculture, sustainable food systems and nutrition, food safety, food losses, sustainable forestry and fisheries, responsible governance to tenure among others, and are fully aligned with the United Nations Sustainable Development Goals Agenda 2030. The FAO eLearning Academy has also created, in collaboration with universities and academic institutions, several joint University Masters' and Post Graduate Degree programmes, based on the FAO eLearning courses. The FAO eLearning Academy is adopting the Digital Badges Certification System, to certify the acquisition of competencies, in order to progress talents within organizations and increase employment opportunities. Certification granted by FAO, by passing the final scenario-based performance evaluation, is now associated to the FAO eLearning courses. Magma Geopark will apply locally and support the dissemination of courses within the UNESCO Global Geoparks and the GEOfood members worldwide. Courses are available here <https://elearning.fao.org>

**Keywords:** Geoparks, competencies, pedagogical models, certification, digital inclusion

**Corresponding author:** [cristina.petracchi@fao.org](mailto:cristina.petracchi@fao.org)

**Reference:**

<https://elearning.fao.org>

## Taking The Geopark To Schools: The Example Of The Geopedagogic Box Project, Of The Oeste Aspiring Geopark

*Maria MARQUES<sup>1\*</sup>, Nuno PIMENTEL<sup>1</sup>, Bruno PEREIRA<sup>1</sup>, Miguel SILVA<sup>1</sup>, Ana PEREIRA<sup>1</sup>,*

*AGEO - Associação Geoparque Oeste<sup>1</sup> Portugal, AGEO-Associação Geoparque Oeste<sup>1</sup> Portugal, AGEO-Associação Geoparque Oeste<sup>1</sup> Portugal, AGEO-Associação Geoparque Oeste<sup>1</sup> Portugal, AGEO-Associação Geoparque Oeste<sup>1</sup> Portugal*

The Oeste aspiring Geopark (OaG), encompasses six municipalities, in the central west region of Portugal (Europe), with a total area of 1,154 km<sup>2</sup> and 72 km of Atlantic coastline. Rocks from the Jurassic period are the geological basis of the territory, representing 77% of the total area, and being known for its many dinosaur discoveries. Aiming to be a Geopark, one main goal of this territory, is to promote the geosciences literacy among schools and the public. Here, we present a Geopedagogic project, which seeks to take the geodiversity elements of OaG to schools, in a didactic and enjoyable way. This project consists of two boxes and four pedagogic guides, adapted to different school years. One box was designed for elementary students (7th grade), while the other for high school students (10th and 11th grade). The box dedicated to the elementary students consists of 10 different rock samples, 2 dinosaur models and 2 dinosaur teeth replicas, while the box dedicated to the high school students has 14 different rock samples and 2 dinosaur teeth replicas. Both dinosaur models and teeth replicas are from dinosaur species discovered in the territory of the OaG. For each age group, two guides were created: one designed for the students and another for the teachers. These guides are divided by chapter, based on the topics lectured on the different target levels, aiming to make a connection between the topics, the content of the boxes, and some of the OaG geosites. Several dynamics are presented in each chapter, to incentivize the use of the guide and make this experience more enjoyable. These dynamics include: interesting curiosities for students; extra suggested content (namely videos, as a complement to the classes); laboratory experiments; tasks; games (letter soups, crosswords, and quizzes); suggestions of places to visit; questions to encourage the observation and analysis of the box; and QR codes directing the reader to websites with more information. The teacher's guide includes solutions for the proposed activities. This project emerged from the need of the teachers from the OaG territory, linking geology topics to their surrounding territory, encouraging students to know more about their region and to preserve its geological heritage, contributing to its divulgation. Therefore, this project will be implemented as a way of promoting the study of geosciences in schools and connecting the local educational communities to its territory.

**Keywords:** Geopedagogic box, pedagogic guides, geosciences, schools, Portugal

**Corresponding author:** ines.mfmarques@gmail.com

**Reference:**

## Estrela Educa: making scientific knowledge accessible to children and young people in the 21st century

Magda FERNANDES<sup>1\*</sup>, Lucas CEZAR<sup>1</sup>, Emanuel DE CASTRO<sup>1</sup>,

Associação Geopark Estrela<sup>1</sup> Portugal, Associação Geopark Estrela<sup>1</sup> Portugal, Associação Geopark Estrela<sup>1</sup> Portugal

Estrela UNESCO Global Geopark (UGGp) has an area of 2,216 km<sup>2</sup>, which includes nine municipalities in Central Portugal, whose identity is directly linked to Serra da Estrela mountain. It holds more than 140 geosites, some of which have international scientific relevance, so the concern with its preservation is vital. Being a UNESCO territory, preservation is promoted through education strategies, rather than a prohibitive attitude. Education is also essential to foster, in the communities, the feeling of belonging to its territory and to its natural and cultural heritage, contributing also to its conservation. In 2020 a world-changing dramatic context has hit society and imposed huge challenges onto Education. Restrictions to social encounters have forced the educational community to adapt to this new scenario, based on remote and dematerialised learning. In addition to that, the abruptness of these changes has taken teachers and parents by surprise, unprepared, especially when teaching abstract matters of the Natural Sciences or Education for Sustainable Development (ESD). They also lacked enough quality resources to fulfill the void experienced in remote learning. Particularly, for Portuguese speaking countries, there are even less digital educational resources that fit the programmes of every educational level and relate to the students' own reality. In order to fulfill this gap, the Estrela UGGp staff designed the project "EstrelaEduca: educational resources for the valorisation of Estrela UGGp's natural heritage", that aimed to develop an online educational platform where teachers, students and their parents could find educational resources in different formats, fitting each educational level and areas of knowledge, and always presenting Estrela UGGp's natural heritage as a tool for understanding the content in each subject, with a special focus on the Geosciences. The first resource designed to integrate this platform was the short animated film "Estrelinha in the Geopark", that aimed to present, in accessible language to children and teenagers, the concepts and information on natural sciences, ESD, Estrela UGGp's natural heritage, UNESCO Global Geopark label and the Portuguese UGGp. For interactive resources, we adapted the quiz/board game "Jogo da Estrela" to the digital platform, in a playable format for the families, or even a child playing solo. In addition to that, a continuous production of interactive educational resources has started, making use of an online tool that allows customisation of game and activity templates. Popular activities such as crossword puzzles, word search puzzles or memory games were adapted to fit contents about Estrela UGGp's natural and cultural heritage. At this moment Estrela Educa already holds tens of educational resources, including games, videos, images and audios, for students from 5 to 18 years-old, and this content is constantly being improved and updated.

**Keywords:** education, digital, educational resources, gamification, Geosciences

**Corresponding author:** magdafernandes@geoparkestrela.pt

**Reference:**

Estrela Educa - educational platform [<https://www.estrelaeduca.pt/>] Short animated film "Estrelinha in the Geopark" [[https://youtu.be/GTBv\\_7BP1oM](https://youtu.be/GTBv_7BP1oM)]

## A Billion Years of Climate Heritage in the Geopark Grevena-Kozani: Field Teaching tools

*Dina GHIKAS<sup>1\*</sup>, Annie RASSIOS<sup>1</sup>,*

*Geopark Grevena-Kozani<sup>1</sup> Greece , Geopark Grevena-Kozani<sup>1</sup> Greece*

Geopark Grevena-Kozani contains nearly a billion years of geohistory and climatic evolution within its rock record and geomorphology. We guide visitors, of all ages and educational levels, through sites that illustrate geologic concepts, paleo-ecologic processes and climatic events. Similar sites can be utilized in other geoparks globally. Our introductory field teaching site illustrates the concept of geologic time: we use Jurassic-aged abyssal cherts as our teaching tool, emphasizing that the time needed for the deposition of each of the thin (5cm) layers of radiolarian chert was about 5,000 years. We can compare a single thin layer to the duration of the entire historic period of Greece, and ask the participants to count the layers and estimate the length of geologic time they represent. Following this, we visit the oldest rocks in Greece, nearly billion-year-old intrusions related to the Amazonian Craton rather than Europe or Africa. Participants, with guided discussion, can hypothesize how remnants of Amazonia could have found their way to modern-day Greece. Additionally, we point out the occurrence of map lichens on these old rock surfaces. Lichens grow at a rate of less than 1mm per year. Thus, our participants can examine the size of our lichens and consider the historic events that took place within their lifespan. Could some of these have been witnesses to the events of Greek Independence in 1821? The Geopark hosts many “living fossil” plant species that correlate our climate conditions to those of the distant past. These include *Equisetum* (horsetail ferns), last surviving genus of a class that arose in the Devonian Period, and remnant Pleistocene forests of *Platanus*, a genus which first appeared in the Cretaceous Period that could have provided food for herbivorous dinosaurs. Our fossil record traces life from the Triassic onwards. The most spectacular specimens are archaic elephant species from the Pliocene to Recent Period (on display in the paleontological museum within the Geopark). Much of this period is characterized by glacially delimited geomorphology: scoured and sculpted terrain at high elevations, with till and loess deposits lower down. During the last periglacial period, five cataclysmic canyons were created by the rapid discharge of glacial outwash. Paleosols from this period occur across the geopark, most likely composed and enriched, in large part, from the droppings of elephants and other extinct megafauna.

**Keywords:** Geopark, Grevena-Kozani, Public Field Education

**Corresponding author:** geowonders@gmail.com

**Reference:**

A. Rassios and G. Grieco Is Geoheritage a “Cutting-Edge” Science? Promotion of an Extension to the Definition of Geoheritage with emphasis as a Significant Discipline in Geosciences with Cultural and Societal RelevanceGSABOOKS-D-18-00020R1

## Study on Effective Interpretive Panels Design for Geosites

Fang REN<sup>1\*</sup>,

Chinese Academy of Geological Sciences<sup>1</sup> China

One of the major purposes of geoparks is geosciences popularization. The popular science interpretation system of geosites is also vital to convey major information for visitors to get a vision about the geoparks as well as get knowledge about the geosites. This study summarizes the reasons why it is generally challenge and difficult to interpret geological sciences to common people using interpretative panels. The effective ways of interpretation panel designs go far beyond conveying information and, in return, affects the communication effect. In addition, this study puts forward the general law of effective interpretative panel design for geosites. The popular reasons affecting the effect interpretation panels include: ① the jargon and obscurity of geoscience terms; ② the vastness and of time and space in geological history scale Vs. the limits of human understanding; ③ sometimes, conflicts between local myth about a geosite Vs. science interpretation. Therefore, the effective interpretative panel can be designed following principle methods: ① The principle of "Maximum Three" —on a interpretative panel, introduction of new ideas and terms should always be no more than three. Do not put on overwhelming information on a single panel. ② The principle of "from known to unknown" —using public common knowledge to explain terminology that the public does not understand, instead of using concepts that the public does not know to explain another concept that they do not know; ③ The principle of "literary rhetoric"; —using analogy, personification, parallelism, rhetorical methods, etc. ④ Use creative but simple interpretive methods.

**Keywords:** geoparks, effective interpretative panel design, interpretation system, geosites, general methods

**Corresponding author:** 546615019@qq.com

**Reference:**

Ren Fang, Simonson L, Pan Z. Interpretation of geoheritage for geotourism—a comparison of Chinese geoparks and national parks in the United States[J]. *Czech Journal of Tourism*, 2013, 2(2): 105-125. Corbally M, O'Neill C. An introduction to the biographical narrative interpretive method[J]. *Nurse researcher*, 2014, 21(5): 34-39. Madin E M P, Fenton D M. Environmental interpretation in the Great Barrier Reef Marine Park: An assessment of programme effectiveness[J]. *Journal of sustainable tourism*, 2004, 12(2): 121-137. White D D. An interpretive study of Yosemite National Park visitors' perspectives toward alternative transportation in Yosemite Valley[J]. *Environmental Management*, 2007, 39(1): 50. Ogunjinmi A A, Ojo L O, Onadeko S A. An appraisal of environmental interpretive policies and strategies of Nigeria national parks[J]. *Tropical Agricultural Research and Extension*, 2010, 12(1). Cho K J. Developing an interpretive planning model for a national park system: a stakeholder-based needs assessment study for Korea[M]. The Ohio State University, 2005.

## Geodiversity, Society and International Geodiversity Day

*Murray GRAY<sup>1\*</sup>, José BRILHA<sup>2</sup>, Jack MATTHEWS<sup>3</sup>, Zbigniew ZWOLINSKI<sup>4</sup>,*

*Queen Mary University of London<sup>1</sup> United Kingdom, University of Minho<sup>2</sup> Portugal, Oxford University Natural History Museum<sup>3</sup> United Kingdom, Adam Mickiewicz University in Poznan<sup>4</sup> Poland*

Geodiversity is the abiotic equivalent of biodiversity and has been defined as “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). This diversity has been brilliantly exploited by human societies for millennia. The value that nature brings to society is nowadays often expressed in terms of “ecosystem services”. These are the goods and functions of natural ecosystems that “sustain and fulfill human life” (Daily, 1997), but this ecosystem services approach has rarely included abiotic nature. This presentation will include examples from both within and beyond geoparks of 25 “geosystem services” - ways in which society benefits from the planet’s geodiversity. In fact, geodiversity is so important to our modern society that we simply couldn’t live without it. For this reason, we have been working to persuade the United Nations Educational, Scientific and Cultural Organization (UNESCO) to establish an International Geodiversity Day on 6th October each year starting in 2022. UNESCO’s Executive Board has already approved the proposal with support from over 70 nations. A final decision is due in November 2021 at UNESCO’s General Meeting. If approved, the day will allow the international geoscience community to promote the importance of geodiversity in every person’s life. Further details are on the website [www.geodiversityday.org](http://www.geodiversityday.org).

**Keywords:** Geodiversity, Society, International Geodiversity Day

**Corresponding author:** [j.m.gray@qmul.ac.uk](mailto:j.m.gray@qmul.ac.uk)

**Reference:**

Gray M. (2013) *Geodiversity: valuing and conserving abiotic nature*, 2nd ed: Wiley Blackwell, UK. Daily G. (1997) *Nature’s services: societal dependence on natural ecosystems*: Island Press, Washington DC.

## Characterization of Geosites for Geoeducative Strategies: Guaranda – San Juan Road (Ecuador) as Case of Study

*Jose Luis SANCHEZ CORTEZ<sup>1\*</sup>, Cesar FUENTES-CAMPUZANO<sup>1</sup>,  
University of Guayaquil<sup>1</sup> Ecuador, University of Guayaquil<sup>1</sup> Ecuador*

Fieldwork is a fundamental tool in the instruction of Earth Sciences, and is widely used in the teaching-learning process. However, establish indicated places that allow covering the mayor number of topics taught in the classroom, it is extremely complex. In the present work, is exposed the case of the Guaranda - San Juan road (Ecuador), as a route with varied geological interests related to the academic contents of geosciences careers. Nevertheless, the contents identified in this road are not only functional for regular or university courses, due to with another interpretative degree it can be used as a geotourism tool. Thus, this pedagogical instrument would fulfill educational and informative functions, promoting the knowledge of Earth Sciences. In addition to the great geodiversity that is evident in the observation points, these identified geosites have been used to strengthen the interpretation of regional geology of Ecuador, since the outcrops are relatively young, due to the recent expansion of the road.

**Keywords:** Geoeducation, Earth Sciences, Ecuador, Geological Interpretation

**Corresponding author:** jossancor@gmail.com

**Reference:**

Sánchez-Cortez, J.L.; Fuentes-Campuzano, C.; Andrade-Díaz, R. (2019). Caracterización de sitios geológicos como herramienta geoeducativa: eje carretero Guaranda – San Juan (Ecuador). *Revista Geográfica Venezolana*. 060 (2), 414-429.

## Demystifying the Cliffs of Fundy: Perspectives on Science Communication in a Newly Designated UNESCO Global Geopark

*Caleb GRANT<sup>1\*</sup>,*

*Cliffs of Fundy UNESCO Global Geopark<sup>1</sup> Canada*

UNESCO Global Geoparks have a unique opportunity to bring the wonders of geology and 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, making this information available, accessible, and engaging to audiences of varied backgrounds and experience levels is a top priority. As a newly designated UNESCO Global Geopark, the Cliffs of Fundy team has taken a holistic approach to interpretation and planning. Although geology is often reserved for the lone and dedicated academics, we feel that the most important part of impactful interpretation is to avoid planning in isolation! Having team members with a variety of skills and different areas of expertise is indispensable in designing accessible experiences that meet the needs of different visitors to a Geopark. Once designed, the implementation of these programs needs to be engaging. Although we have just completed our first year of programming, feedback indicates enthusiasm and creative interpretation/ metaphors with which our audience can relate, have been powerful strategies for explaining complex geological concepts. From our experience, it has become more and more apparent that the key to communicating a Geopark's geology is not in the geology at all, but rather in its cultural heritage and in the Geopark community.

**Keywords:** Geopark, Cliffs of Fundy, Interpretation, Accessible, Engaging

**Corresponding author:** [caleb.grant@fundygeopark.ca](mailto:caleb.grant@fundygeopark.ca)

**Reference:**

Grant, C. J. (2021). Demystifying the Cliffs of Fundy: Perspectives on Science Communication in a Newly Designated UNESCO Global Geopark. Abstract, Jeju 2020 International Conference on UNESCO Global Geoparks.

## Co-producing and Sharing Knowledge for Action on Coastal Risk and Resilience in the Great Lakes, Niagara Region, Canada

*Bradley MAY<sup>1\*</sup>, Liette VASSEUR<sup>2</sup>, Meredith CASPELL<sup>2</sup>,  
Brock University<sup>1</sup> Canada, Brock University<sup>2</sup> Canada, Brock University<sup>2</sup> Canada*

As coastal and shoreline communities in Canada face increased risk with respect to climate change and extreme weather events, adaptation and resilience building becomes a crucial stake of local development. Several challenges face local communities in this endeavour, such as a lack of resources, of scientific knowledge, the complicated articulation of the various levels of governance, conflicts of interest in communities, the mobilization of social capital, or the inability to project in the future on time scales relevant to climate change. In this context, the co-production of knowledge between researchers and local decision-makers is increasingly important. This is increasingly important in the Great Lakes Basin of Central Canada. To this end, a local project, "The MEOPAR-Lincoln Community Sustainability Project" was initiated in the Niagara Region of Ontario. Some of the activities that were produced to provide information to the residents was the development of a StoryMap tool to visualize changes in coastal vulnerability over time and use of an on-line public-to-public decision support tool to explore community shoreline risk reduction options and the overarching values reflected by each option. Coupled with on-line engagement, blogs in newspapers, and updates on project status, the community has become more aware of their fragile environment, including the geology of its coast. This research highlights how Aspiring Geopark and Biosphere Reserve designations can contribute to understanding overall contributions to community sustainability.

**Keywords:** Great Lakes, coastal risk, knowledge co-production, adaptation, resilience, coastal risk, knowledge co-production, adaptation, resilience

**Corresponding author:** [bmay@brocku.ca](mailto:bmay@brocku.ca)

**Reference:**

Vasseur, L., May, B. and Caspell, M., 2021. Co-producing and Sharing Knowledge for Action on Coastal Risk and Resilience in the Great Lakes, Niagara Region, Canada, presentation to the 9th International Conference on UNESCO Global Geoparks, December.

## The International Observatory For UNESCO Global Geoparks: A Tool To Boost The Development And Improvement Of Research, Education And Sustainable Development In These Territories

Artur SÁ<sup>1\*</sup>, Nickolas ZOUROS<sup>2,3</sup>, Elizabeth SILVA<sup>1</sup>, Guy MARTINI<sup>3</sup>, Kristin RANGNES<sup>4</sup>, José Patricio MELO<sup>5</sup>, Xiaochi JIN<sup>6</sup>, Driss ACHBAL<sup>7</sup>, John CALDER<sup>8</sup>, Konstantina BENTANA<sup>2,9</sup>, Ilias VALIAKOS<sup>2,9</sup>, José Luís PALACIO-PRIETO<sup>10</sup>, Thais GUIMARÃES<sup>1</sup>, Kristof VANDENBERGHE<sup>11</sup> & Emmaline ROSADO-GONZÁLEZ<sup>1</sup>

<sup>1</sup>UNESCO Chair on Geoparks, Sustainable Regional Development and Healthy Lifestyles, University of Trás-os-Montes e Alto Douro and Geosciences Centre (CGeo); <sup>2</sup>UNESCO Chair on Geoparks and Sustainable Development of Insular and Coastal Areas, University of the Aegean; <sup>3</sup>Global Geoparks Network Association (GGNa); <sup>4</sup>European Geoparks Network (EGN); <sup>5</sup>Latin America and Caribbean UNESCO Global Geoparks Network (GeoLAC); <sup>6</sup>Asia Pacific Geoparks Network (APGN); <sup>7</sup>African UNESCO Global Geoparks Network (AUGGN); <sup>8</sup>Canadian UNESCO Global Geoparks Network; <sup>9</sup>Natural History Museum of the Lesvos Petrified Forest; <sup>10</sup>Geography Institute, National Autonomous University of Mexico (UNAM);<sup>11</sup> UNESCO Section for Earth Sciences and Geo-Hazard Risk Reduction

The UNESCO Global Geoparks (UGGps) in their guidelines and principles had the commitment to contribute to biotic and abiotic nature conservation, through education, science, and culture, promoting diverse and innovative strategies towards local sustainability, social inclusion, and risk reduction of the labelled territories. In this sense, is being established the International Observatory for UNESCO Global Geoparks (IOBUGG). This instrument for collecting and processing data on the management and operation of the territories designated as UGGps, will focus on the activities promoted and developed in these territories considering some of its 'Top 10 Focus Areas'. This Observatory will be led in partnership by the UNESCO Chair on "Geoparks, Sustainable Regional Development and Healthy Lifestyles", of the University of Trás-os-Montes e Alto Douro (Portugal), and by the UNESCO Chair on "Geoparks and Sustainable Development of Insular and Coastal Areas" of the University of the Aegean (Greece). The proposed observatory is intended to serve as a forum for the exchange of experiences and, at the same time, as a platform for the collection, analysis, systematisation, and dissemination of data resulting from the activities and examples of good practice of the UGGps in the mentioned focus areas. This platform will support the implementation of territorial strategies, allowing access to relevant, useful, and reliable knowledge resources, providing advice, promoting dialogue, and supporting training initiatives. Bearing in mind that the observatory's mission is to compile, classify and disseminate data on the activities carried out in the territories designated as UGGps, this reality will enable the creation of an organised, classified, and open-access database that will allow the updated sharing of initiatives, impacts and good practices in these territories. Regarding the expected results of this platform, a web page will be developed with permanent information on the update of public databases. These will be displayed and exposed through maps, dashboards, and social media. It is also planned to publish a digital annual report, as well as a digital quarterly newsletter with the main highlights. With the work carried out within the IOBUGG, it will be possible to demonstrate, with quantified data in a continuous and updated manner, how UGGps work every day in achieving territorial management, risk reduction, social inclusion, local sustainability, and capacity building. This new tool will allow disseminating the essential results of the good practices developed by UGGps for a greater and better understanding of the importance and impacts of these territories at a global scale.

**Key words:** UNESCO Global Geoparks, International Observatory, territorial good practices, data management

**Corresponding author:** asa@utad.pt

### References

UNESCO (2016). *UNESCO Global Geoparks. Celebrating Earth Heritage, Sustaining Local Communities*. UNESCO, Paris, France, 20 pp.

## Operation of the Geopark Programs for Raising Awareness of Local and Global Issues

*JU Seongok<sup>1\*</sup>,*

*Cheongsong Geopark<sup>1</sup> Republic of Korea*

The purpose of the operation of Cheongsong Geopark, located in the Middle East of Korea, is 1) the aging population and population outflow issues in the local and 2) climate change issues facing humanity around the world to raise people's knowledge and awareness. To achieve the goal, Cheongsong Geopark operates programs linking nature, ecology, and cultural heritage, of Juwangsan Mountain (tuff) and Sinseong Valley (sedimentary rock, dinosaur footprints) recorded of Earth's history. In particular, geo-education programs are filled with educational and entertainment (edutainment) content that allows people to enjoy and learn geology easily, such as camping, challenge activities, upcycling, and making geofoods. However, due to COVID-19, the number of participants in the geopark program decreased by 55% in 2020. So Cheongsong Geopark operates a non-contact (online) geological education program using experience kits (volcano explosion experiment kits, fossil excavation experiment kits) to popularize scientific knowledge. It is also promoting Cheongsong Geopark through SNS and supports environmental conservation activities.

**Keywords:** Cheongsong, Geo-education, Science populization

**Corresponding author:** geo616@korea.kr

**Reference:**

## Interpreting the Sites of Geoparks: A Case of Xingwen UNESCO Global Geopark

*Kejian XU<sup>1,2\*</sup>, Yuemei XU<sup>1</sup>,*

*Xingwen Geopark Administrative Bureau<sup>1</sup> China, Xingwen Geopark Administrative Bureau<sup>1</sup> China,*

*China University of Geosciences<sup>2</sup> China*

The interpretation of the sites of geoparks is considered the art of explaining the meaning and significance of the sites to the visitors. Well-done interpretation can (1) improve the quality image of the geopark, enhance visitor appreciation and promote better understanding. As a result the visitors are more likely to care for what they identify as a precious resource, (2) enhance the visitor experience, resulting in longer stays and repeat visits. This will lead to increased income and create employment opportunities, and (3) strengthen the relationship between the site and those who live around it, which will encourage local communities to look after the site. Therefore, providing effective means for geoscience education and broader environmental issues to the public is a must for a UNESCO Global Geopark. This paper introduces 5 simple steps to interpreting sites and presents how to tell stories of Xingwen UGGp for school children. The effectiveness of interpretation has been evaluated and the excellent feedback from the the students has been recieved. This can provide a reference for the interpretation of the sites of geoparks.

**Keywords:** Interpretation, Geopark, Xingwen Geopark, Geoheritage

**Corresponding author:** kejian77@foxmail.com

**Reference:**

Tilden, F. (1977). *Interpreting our heritage* (3rd ed.). Chapel Hill, NC: University of North Carolina Press. Tubb, K.N. (2003). An evaluation of the effectiveness of interpretation within Dartmoor National Park in reaching the goals of sustainable tourism development. *Journal of Sustainable Tourism*, 11, 476–498. Sureda, J., Oliver, M.F. and Castells, M. (2004) Indicators for the evaluation of environmental education, interpretation and information in protected areas. *Applied Environmental Education and Communication* 3, 171–181.

## Rainbow Mountain On The Silk Road - Zhangye UNESCO Global Geopark

*Miao RONG<sup>1\*</sup>,*

*Zhangye National Geopark Administration<sup>1</sup> China*

Caiqiu(Colorful Hills) is one of characteristics in Zhangye UNESCO Global Geopark, it is composed of the Early Cretaceous mudstone and silty mudstone which deposited in a lake about 137-96 million years ago. Due to different minerals in rocks, Caiqiu shows marvelously varied colors. Since the establishment of Zhangye Geopark in 2012, the administration implemented a variety of methods to promote local development based on research. The local tourism grew rapidly and the life of the communities has been totally changed. Meanwhile, the administration fully utilized the research results, as well as high scientific and aesthetic value of Caiqiu to promote popular science education. Caiqiu has become a hot spot for field education of middle-school and college students. Additionally, the administration built a scientific research base and a field investigation station during the UGGp application process in an attempt to serve the global research team and achieve results which can be transformed as sustainable development momentum.

**Keywords:** Caiqiu(Colorful Hills), popular science

**Corresponding author:** 549619616@qq.com

**Reference:**

Lin Qixia, Characteristics of Geoheritage and Geotourism Strategy of Zhangye Geopark Zhang Yao, Relationship between Geoheritage Resources and Cultural Heritage in Zhangye Geopark

## Local Knowledge on Geoheritage in Vietnam's Geoparks - Some Preliminary Studies

*Yen Ngoc DO THI<sup>1\*</sup>, Van TRAN TAN<sup>1</sup>, Huyen DOAN THI NGOC<sup>1</sup>, Hai PHAM MINH<sup>1</sup>, Duc HOANG XUAN<sup>1</sup>,*

*Vietnam Institute of Geosciences and Mineral Resources (VIGMR)<sup>1</sup> Vietnam, Vietnam Institute of Geosciences and Mineral Resources (VIGMR)<sup>1</sup> Vietnam, Vietnam Institute of Geosciences and Mineral Resources (VIGMR)<sup>1</sup> Vietnam, Vietnam Institute of Geosciences and Mineral Resources (VIGMR)<sup>1</sup> Vietnam, Vietnam Institute of Geosciences and Mineral Resources (VIGMR)<sup>1</sup> Vietnam*

Indigenous knowledge (IK) on geo-heritage is an essential part of the indigenous knowledge in general, mainly related to perception, which is passed down from generation to generation, of local people about nature and their interaction with nature; their adaptation and creativity before nature. Indigenous knowledge on geo-heritage is also closely related to the way local people sustainably manage, use and exploit various types of natural resources to endure with nature. However, unlike indigenous knowledge in general, indigenous knowledge on geo-heritage has only been mentioned for the past ten years, both in the world and in Vietnam, and has not been summarized. Meanwhile, the insight on indigenous knowledge on geo-heritage, similar to the general indigenous knowledge, is certainly very useful. Therefore, the "Studying indigenous knowledge on geo-heritage in some geoparks in Vietnam", not only increases, in terms of both quantity and quality, the heritage values in these geoparks but also enhances the effectiveness of the community education on heritage and Geopark, including the geo-heritage, which is very necessary and practical to contribute to the conservation and promotion of heritage values and sustainable socio-economic development.

**Keywords:** Geopark, Geoheritage, Indigenous knowledge

**Corresponding author:** yennhoc1968@gmail.com

**Reference:**

1. Do Thi Yen Ngoc, Tran Tan Van, Doan Thi Ngoc Huyen, 2017. An introduction on indigenous knowledge of geoheritage in Non Nuoc Cao Bang Geopark (Oral); The 5th Asia - Pacific geoparks network symposium Zhijindong UNESCO Global Geopark, Guizhou China (APGN) 19-22 Sept. 2017. Abstract book APGN 2017.
2. Ngoc Do Thi Yen, Van Tran Tan, Thuy Trinh Thi, Thuy Nguyen Thi, 2018. Indigenous knowledge on geoheritage - some preliminary studies in aspiring Gia Lai Geopark (Gia Lai province) (Oral). 8th International conference on UNESCO Global Geopark Adamello Brenta Geopark Madonna di Campiglia Italia 8-16 Sept. 2018; ABSTRACT\_BOOK\_integrated 2018.
3. Do Thi Yen Ngoc, Tran Tan Van, Pham Thi Thuy, 2019. Indigenous knowledge of geoheritage in aspiring Quang Ngai Geopark (Vietnam) (oral). The 6th Asia - Pacific geoparks network symposium Lombok Indonesia (2 - 7 Sept.2019). ABSTRACT-BOOK-APGN 2019.

## Education and SDGs Activities in the Oki Islands UNESCO Global Geopark

*Takayuki FUKUDA<sup>1\*</sup>,*

*NPO Oki Shizen Mura (Oki Nature Village)<sup>1</sup> Japan*

UNESCO Global Geoparks around the world carry out various activities to reach the sustainable development goals, set in order to ensure a better world for everyone. We decided to start a new project in a local high school, that merges geopark education aimed at conservation through community study and SDGs movement which aims at solving local challenges through a global standpoint. During geopark studies, the students in Oki High School learned about the forest and marine environments, how indispensable nature is for our daily lives, and used that knowledge in their actions. That is how an Oki Islands' version of a card game developed jointly by a university and private company came to life. In this game, players think about ways to reach the sustainable development goals through their own actions. Students familiarize themselves with SDGs through a game format, a more approachable method than traditional education, and come up with ideas on how to solve various problems. The game uses two types of cards, one linked to a specific goal ("trade-off card") and another representing a local resource ("resource card"). The students first learned to play the original version of the game, and later rearranged it to fit the local needs and circumstances of the Oki Islands. There are two aspects in which the Oki version of the game differs from the original. Firstly, the game uses particular resources that can be found on the islands. Secondly, it specifies the period within which actions should be taken, such as "start from tomorrow" or "reach the goal in five years". Developing the game was not the final goal of the project. The school plans to update the game regularly, and through that create an archive of the challenges and resources that exist on the islands in specific periods of time. The game will provide a peek into the state of progress of the geopark activities.

**Keywords:** Oki Islands, geopark, education, SDGs, regional cooperation

**Corresponding author:** sizenmura@navy.plala.or.jp

**Reference:**

1. Kanazawa Institute of Technology, SDGs Education THE SDGs Action Cardgame "X(cross)", accessed 12 November 2021, <https://www.kanazawa-it.ac.jp/sdgs/education/application/game-1-en.html>.

## Geopark Education Through Project Based Learning for the Empowerment of the Local Community

*Minamo NOBE<sup>1</sup>\*,*

*Okinoshima Town Board of Education<sup>1</sup> Japan*

Oki High School in the Oki Islands Geopark has been conducting geopark education programmes since 2010. Since 2015, through trial and error, we are now focusing on Project Based Learning (PBL) utilizing the Geopark. Through this education, students learn to take pride in Oki as residents, and also develop non-cognitive skills that are difficult to see in numerical values, which are required throughout Japan for assessment purposes. We believe that this will lead to the development of human resources who can think independently about what they can do and act accordingly. In this education, we place emphasis on two things: getting involved with people and taking action. In the first and second years, students work in teams for more than one year in the "Geopark Research" course, which is part of the Period for Inquiry-Based Cross-Disciplinary Study. In the third-year option course, "Geopark Exploration," students specialize in business and work with companies to find ways to generate revenue. The students also work to extend the learning they have gained through their studies to the local community. The ability of the high school to engage in this education is largely due to the close cooperation with the Oki Islands UNESCO Global Geopark Promotion Committee. They support the students' activities together with the teachers in many ways. In particular, having a research staff close by is very helpful in promoting learning. Last year, Sony's Telepresence System "MADO" was introduced to the school as a joint project between the promotion committee and Sony, which has further expanded the range of activities for students.

**Keywords:** project based learning, education, non-cognitive skills, high school, Oki Islands

**Corresponding author:** oki.miryoku2@gmail.com

**Reference:**

1. Kagawa University, Geoparks x Global Human Resources Development Symposium Compilation, 2021. (Japanese) 2. The Nature and People of the Oki Islands. Lesson and Activities Program Utilizing the National Park and the Geopark, Chugoku-Shikoku Regional Environment Office, 2016. (Japanese) 3. Y. Nakayama, Gakuryoku Tesuto de Hakarenai Hininchi Nouryoku ga Kodomo wo Nobasu (Non-cognitive skills, unmeasured by academic achievement tests, bring out children's abilities), Tokyo Shoseki Co. Ltd., 2021. (Japanese) 4. T. Suzuki, Ai Jidai no Kyouiku to Hyouka. (Education and Assessment in the Age of AI), KYOIKU-SHUPPAN Co., Ltd., 2017. (Japanese) 5. T. Suzuki, Kadai Kaiketsuryoku to Ronriteki Shikouryoku ga Mi ni Tsuku. Purojekuto Gakushuu no Kihon to Shuhou (Acquiring Problem-solving Skills and Logical Thinking Skills. Basics and Methods of Project-Based Learning), KYOIKU-SHUPPAN Co., Ltd., 2017. (Japanese)

## Operation and Improvement of the Hantangang River Global Geopark Program in the post-COVID-19

*KANG Suna<sup>1\*</sup>,*

*Hantangang River Geopark<sup>1</sup> Republic of Korea*

The prolonged COVID-19 has brought about the spread of non-face-to-face culture throughout society. Various programs operated by geoparks are being converted into non-face-to-face programs. The Hantangang River Global Geopark was certified by UNESCO in 2020. Hantangang River Global Geopark operated various experience and education programs, but it is difficult to operate face-to-face programs due to COVID-19. Accordingly, the Hantangang River Global Geopark considered the change in the program operation method and operated various online programs. The most basic program, the guide tour, produced an online guide tour video and uploaded it to YouTube, and the visitor center prepared an audio guide that can speak four languages and rent it to visitor. In addition, the visitor center VR was produced for visitors who have difficulty visiting the visitor center, and an online exhibition room was operated so that they can be viewed on the website. In the case of face-to-face performances, the appropriate number of people was limited according to the stage of distancing, and the personal information and body temperature of visitors were measured and operated according to quarantine rules. In the case of non-face-to-face performances, various performances are performed according to the characteristics of geosite, and the performances are transmitted online in real time so that many people can watch them. In the case of educational programs, an online quiz show was held and about 300 people from all over the country participated and operated. The geosite, Bibulginang Falls, was filmed in VR and educated online while observing the topographic map in 3D. In addition, if five missions are successful at the geosite, a souvenir event will be held to enhance understanding of the geosite. As a healing program, a healing program was conducted using aroma oil and flower tea when ASMR was filmed at Bibulginang Falls and applied in advance. Finally, an International online academic conference was held and conducted by various scholars with the goal of sustainable development of the Hantangang River Global Geopark. COVID-19 has brought rapid changes to us throughout society, but we think this opportunity can be a starting point for running programs not only for domestic but also for overseas visitor through non-face-to-face programs.

**Keywords:** Hantangang River, Geopark, Program, COVID-19, Online program

**Corresponding author:** geopark@korea.kr

**Reference:**

## Culture-Based Conservation Education Approach At Sunda Geopark, West Java Province

Januarani RAZAK<sup>1\*</sup>, Endah Kartika SYAHRI<sup>1</sup>,  
*Aspiring Geopark Sunda<sup>1</sup> Indonesia, Aspiring Geopark Sunda<sup>1</sup> Indonesia*

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. This fact shows that the existence of Geosites in the Sunda Geopark is in direct contact with the lives of local people. The lack of public awareness about Geosite conservation is a real threat in the Sunda Geopark, even for Geoparks throughout Indonesia. There needs to be an appropriate form of conservation education as a follow-up to this problem. In Indonesia, local wisdom and traditional customs are the best instruments in forming an education system based on environmental conservation. On the other hand, most people who live around the Sunda Geopark area are Sundanese local people since ancient times who have unique habits in terms of nature conservation known as three procedures, namely Tata Wilayah, Tata Wayah, and Tata Lampah. These three procedures have the meaning that the natural environment is a symbol for human life, ethics, and aesthetics that must be maintained. Geopark conservation education based on Sundanese Culture in an educational guidebook is one of the instruments that can be applied to the community. The Sundanese Culture-based Geopark conservation education book utilizes storytelling techniques in its implementation. The reappearance of natural conservation myths typical of the Sundanese people is also a form of cultural preservation and nature conservation. Through pictures and exciting stories, it is hoped that this technique will be one of the innovations in educating the public to preserve the Sunda Geopark.

**Keywords:** Ancient Sunda Mountain, Sunda Geopark, Sundanese Culture, Conservation Education Books

**Corresponding author:** januaranirazak@gmail.com

**Reference:**

- Bemmelen, V. (1949). *General Geology of Indonesia and Adjacent Archipelagoes*. Government Printing, The Hague.
- Darsiharjo, Supriatna, & Saputra, I. M. (2016). Pengembangan Geopark Ciletuh Berbasis Partisipasi Masyarakat sebagai Kawasan Geowisata di Kabupaten Sukabumi (Ciletuh Geopark Development Based on Community Participation as a Geotourism Area in Sukabumi Regency). *Jurnal Manajemen Resort dan Leisure*. 13(1), 55-60.
- Pertarung. (2021). Sosialisasi Kebijakan Pengembangan Geopark dan Pembangunan Nasional (Socialization of Geopark Development Policy and National Development). Available online in <https://pertarung.kulonprogokab.go.id/detil/795/sosialisasi-kebijakan-pengembangan-geopark-dan-pembangunan-nasional>.
- Accessed on November 10, 2021. Research Team Field Observations in 2021
- Setiawan, A. Y., Kamil, G., & Rohmat, D. (2012). Nilai-Nilai Tata Lingkungan Terhadap Kelestarian Lingkungan di Kampung Cikondang Kabupaten Bandung dan Implikasinya dalam Pembelajaran Geografi (The Values of Environmental Management on Environmental Sustainability in Cikondang Village, Bandung Regency and Its Implications in Learning Geography). *Jurnal Pendidikan Geografi*. 12(2): 61-70.
- Simatupang, K., & Purba, R. R. (2019). Peran Masyarakat Lokal dalam Pengembangan Geosite Geopark Kaldera Toba Silahisabungan Menuju Geopark Global UNESCO (The Role of Local Communities in the Development of the Toba Caldera Geopark Geopark Silahisabungan Towards a UNESCO Global Geopark). *Jurnal Ekonomi dan Industri*, 20(3), 39-48.
- Suyatman. (2018). Teologi Lingkungan dalam Kearifan Lokal Masyarakat Sunda (Environmental Theology in Sundanese Local Wisdom). *Jurnal al-Tsaqafa*. 15(1): 77-88.

## Towards an Inclusive interpretation of Vikos-Aoos Unesco Global Geopark through the project "Listen-Touch-Feel" of Ecomuseum Zagori

*Panagiota KOUTSOUKOU<sup>1</sup>, Konstantinos KAISARIS<sup>1\*</sup>,  
ECOMUSEUMZAGORI<sup>1</sup> Greece, ECOMUSEUMZAGORI<sup>1</sup> Greece*

The notion of cultural accessibility has a central role in integrated heritage management policies and especially in regard to UNESCO-nominated sites. Within this framework, Ecomuseum Zagori implemented the educational pilot project "Listen-Touch-Feel", aimed at engaging visually impaired people, with the natural and cultural heritage of Vikos-Aoos UNESCO Global Geopark (UGGp). Ecomuseum Zagori is one of the major socially driven, local development social enterprises in the Epirus region, operating in compliance with UNESCO's cultural policies by implementing awareness-raising and capacity building community-led programs, in the cultural landscape of Zagori including within the Vikos-Aoos Geopark. The main idea was to design an innovative program for the visually impaired, by combining interactive visual methods such as 3D printing and soundscape walks. More specifically, traditional historic bridges, cultural landmarks of the Geopark, were scaled down to 3D printed models along with their surrounding landscape, in order to be interpreted through touch and soundscape recordings with audio stimuli addressed to small groups. The project was implemented in two parts. The first was focused on Capacity Building and Training. Informational seminars were held online to inform the wider public regarding new technological possibilities on the accessibility of cultural landscapes, including associations of visually impaired people, by presenting best practices and specific actions from open-source products to commercial technologies. The second part was devoted to on-site implementation. The groups took part in explanatory walks, including a participatory soundscape recording tour on a trail. The 3D depiction of the bridges and their surrounding geomorphology helped to better realize monuments setting through touch. All walks were accompanied by an audio description (narration of the visual content) and audio stimuli from the soundscape collection. The soundscape methodology was chosen as a tool to replace the lack of vision of blind people with acoustics. Moreover, the groups were encouraged to experiment with soundscape recording, according to the principles of acoustic ecology. The action's originality was based on the personalized experience of the interpretative walks in the in-situ monuments of the Geopark, through methods that enhance spatial perception, whilst allowing landscape interaction. Direct beneficiaries among blind people, were trainers, educators, and volunteers.

**Keywords:** Geopark, Accessibility, Heritage, Soundscape

**Corresponding author:** [ecomuseumzagori@gmail.com](mailto:ecomuseumzagori@gmail.com)

**Reference:**

Charitakis Papaioannou Vikos-Aoos Unesco Global Geopark

## Salpausselkä Geopark Programme For Early Childhood Education

*Kati KOMULAINEN<sup>1\*</sup>, Emma MARJAMÄKI<sup>2</sup>, Jenni JELKÄNEN<sup>2</sup>, Josefiina MAROLA<sup>3</sup>,*

*Salpausselkä Geopark<sup>1</sup> Finland, CityofLahti Environmental Department<sup>2</sup> Finland, CityofLahti Environmental Department<sup>2</sup> Finland, Kanerva Kindergarten, Cityof Lahti<sup>3</sup> Finland*

The Salpausselkä Geopark area, located in southern Finland, encompasses six municipalities that are home to some 178,000 inhabitants. The key geological features of the area – glaciofluvial ridges, hundreds of lakes and outcrops of a nearly 2-billion-year-old bedrock – form an integral part of the daily living environment of the local people. In this setting, the Salpausselkä Aspiring UNESCO Global Geopark provides environmental education for learners on all levels, aiming to educate them to appreciate the special features of their local environment and to connect a sustainable way of life to their local identity and their sense of belonging to the place. The main emphasis is on outdoor education, which also allows the target groups to benefit from the positive well-being effects of nature. Two full-time environmental educators of the City of Lahti, the main city of the geopark, are in charge of the Salpausselkä Geopark environmental education for children and young people, within the framework of the city's quality certified environmental education and in cooperation with the geopark manager and geoscientist. In recent years, one of the main development tasks has been to create a geopark early childhood education programme for children not older than 7 years of age. The programme has evolved around the concept of Salpausselkä Geopark Kindergarten, which was developed in cooperation with a pilot kindergarten and the steering group of the Eco-School kindergartens of Lahti during 2018-20. After the piloting phase, the programme was launched in 2020. All the kindergartens within the geopark can apply. Meeting the criteria set for a Salpausselkä Geopark Kindergarten ensures that knowledge and skills needed for a sustainable way of life are taught and that the natural surroundings of the kindergartens are used actively and sustainably as a learning environment. The criteria for a Salpausselkä Geopark Kindergarten include, e.g., the following: the geopark theme is reflected in the kindergarten's early childhood education plan, the kindergarten selects each year one of the UN Agenda 2030 goals and runs a development project within the topic, every child gets into the natural surroundings at least once a week, the kindergarten is committed to increasing the use of nearby nature as a learning environment and an inventory of the nearby nature is carried out with the children once a year. The staff of the kindergartens participating in the programme get a training of experiential learning methods, based on scientific knowledge, and are provided with materials and instructions. After the training, the environmental educators support the kindergarten staff, helping them to fulfil the criteria. While the programme is being developed further, the results so far include new, innovative ways of interpreting the geology to, or rather with, young children.

**Keywords:** early childhood education, environmental education, outdoor education, geopark, Finland

**Corresponding author:** kati.komulainen@lahtiregion.fi

**Reference:**

<https://visitlahti.fi/en/frontpage/salpausselka-geopark/>

## Time Traveller – A New, Innovative Toolkit for Geoheritage Interpretation in Rokua UNESCO Global Geopark, Finland

*Mikko KIUTTU<sup>1\*</sup>, Kyösti KOSKELA<sup>2</sup>, Vesa KRÖKKI<sup>1</sup>,*

*Rokua UNESCO Global Geopark<sup>1</sup> Finland, Clever Simulation Entertainmentteam, Kajaani University of Applied Sciences<sup>2</sup> Finland, Rokua UNESCO Global Geopark<sup>1</sup> Finland*

Rokua UNESCO Global Geopark (RUGGp) in Finland celebrates the heritage of the last Ice Age. The traces of continental ice sheet and melt water streams are exceptionally well visible, and many of the formations reach superlatives in Finland. The quaternary landforms reflect properties of local bedrock that ranges from Archean to Proterozoic times. The unique geology creates habitats for several rare species and affects in many ways to the human history and cultural appearances in the area. However, geological time and ancient environments are challenging to imagine for the average visitors. That's why RUGGp created a new way to demonstrate the development of the Geopark's landscape. Together with Kajaani University of Applied Sciences, located close to the Geopark territory, Rokua UGGp designed virtual reality (VR) models illustrating the main phases of the landscape's history. The VR models are located in three geosites of the Geopark: an Archean gneiss outcrop, a Weichselian esker mound and a rapid which is surrounded by a river delta from prehistoric time. All of the sites have five "time windows" visualizing geological processes, forms of life, climate and cultural aspects at the time when the main features of the present-day sites developed. The user can, for example, explore a glacial melt water stream on the edge of a continental ice sheet or visit a Stone Age village on the prehistorical coastline. Thus, the models demonstrate the story of the Geopark. The contents and the visual appearance of the models have been designed in collaboration with the Geological Survey of Finland and the Regional Museum, and edited with local teachers to ensure the pedagogical usability. The VR models are part of a larger interpretation tool kit including new Geopark exhibitions with VR Headsets in the area's municipalities, a mobile map application with a link to the VR models and a hand manual supporting the discovery of the area. The mobile application uses an innovation for displaying the VR models in Youtube 360-videos. The toolkit is free for use, and the local entrepreneurs and teachers are being familiarized with it. For a visitor, it provides an attractive overview of the area and its history, and the local people can discover their home region from a new perspective.

**Keywords:** virtual reality, innovation, geoeducation, geoheritage, geopark

**Corresponding author:** mikko.kiuttu@humanpolis.fi

**Reference:**

<https://www.rokuageopark.fi>

## The "BROMACKER" research project: new ways of knowledge transfer

*Mauro ALIVERNINI<sup>1\*</sup>, Sylvia REYER-ROHDE<sup>1</sup>,*

*UGG Thuringia Inselsberg-Drei Gleichen<sup>1</sup> Germany, UGG Thuringia Inselsberg-Drei Gleichen<sup>1</sup> Germany*

The "Bromacker" fossil deposit (Early-Permian) is located in the UGG Thuringia Inselsberg-Drei Gleichen (Central Germany) and has represented for more than 100 years one of the most significant and productive fossil deposits for terrestrial tetrapods. The site is unique in the world in terms of conservation of fossils as well as their extraordinarily large biodiversity and a new research project started in 2020 focused on detailed mapping and drillings is contributing to reconstruct habitat and climate evolution in this area. To enhance and to directly interlink research and knowledge transfer, a cooperation among 4 different institutions in Germany to target different interested groups with a new experimental approach was established. Alongside several digital and physical exhibitions where findings and excavation techniques are represented, a further new approach is the activities on social media during the excavation campaigns. Researchers and technical staff are explaining daily their various activities in short and simple terms with the aim of attracting attention of younger groups in scientific research. Moreover, a network together with several local schools was established to offer advanced formation for teachers and pupils. The formation offer includes seminars about the Geopark's geology, museums and research activities including the use of microscopes and 3D technologies. This integrated approach is providing an increase of visitors in the Geopark area and could be a valuable tool of promotion of geological research and geotourism.

**Keywords:** Thuringia, Geopark, Bromacker fossil site, Knowledge transfer, Research and geotourism promotion

**Corresponding author:** mauro.alivernini@eta-reyer.de

**Reference:**

Martens T., Berman D.S., Henrici A.C. and Sumida S.S., 2005. "The Bromacker quarry—the most important locality of Lower Permian terrestrial vertebrate fossils outside of North America" in: Spencer G. Lucas & Kate E. Zeigler "The Nonmarine Permian". New Mexico Museum of Natural History & Science. Bulletin 30 : 214-216

<https://www.geopark-thueringen.de/en/translate-to-en-forschung/translate-to-en-bromacker-projekt>

## Understanding Natural Hazards With The Local Population In The Chablais UGGp, France

*Sophie JUSTICE<sup>1\*</sup>,  
Chablais UGGp<sup>1</sup> France*

Natural hazards are present in all territories, but they are not always well known or obvious to the local population. Raising public awareness around hazards requires careful preparation in order to communicate clearly scientific ideas. Furthermore, the activities and information shared need to educate and not alarm the public. The French territory of the Chablais UGGp chose to work on an educational initiative open to the general public to inform them of the many natural hazards that were present in the region. Using a mixture of fieldtrips led by official Geopark guides, public talks and a temporary exhibition, different methods were used to share simple knowledge about the main risks of landslides, rockfalls, avalanches, floods, earthquakes and tsunamis. In addition to this a science village was organized comprised of both stands sharing information and those proposing workshops around different themes. To complete the offer, different scientists and technical professionals were present and able to provide more detailed explanations to those searching to deepen their understanding of the Earth's natural processes and the prevention and preparedness measures that can be put in place. The different hazards were illustrated exclusively using scientific examples from the local area drawn from different periods: human memory, historic record and the recent geological record.

**Keywords:** Natural hazards, Science communication, Outreach, Education

**Corresponding author:** [coordinatongeopark@siac-chablais.fr](mailto:coordinatongeopark@siac-chablais.fr)

**Reference:**

Chablais UNESCO Global Geopark, SIAC, Square Voltaire, 2 avenue des Allobroges, 74200 Thonon, France

## Five Years Of The UNESCO Chair On Geoparks, Regional Sustainable Development, And Healthy Lifestyles – Changing The World Through Education

Artur A. SÁ<sup>1\*</sup>, Emmaline ROSADO-GONZÁLEZ<sup>1</sup>, Elizabeth SILVA<sup>2</sup>,

UNESCO Chair on Geoparks, Regional Sustainable Development and Healthy Lifestyles, University of Trás-os-Montes e Alto Douro (UTAD), Vila Real, Portugal<sup>1</sup> Portugal, UNESCO Chair on Geoparks, Regional Sustainable Development and Healthy Lifestyles, University of Trás-os-Montes e Alto Douro (UTAD), Vila Real, Portugal<sup>1</sup> Portugal, Geosciences Centre of University of Coimbra, Coimbra, Portugal<sup>2</sup> Portugal

The UNESCO Chair on Geoparks, Regional Sustainable Development, and Healthy Lifestyles has celebrated its fifth anniversary, in 2021. Since its creation, its main goal has been to create an innovative and integrated network of research, teaching and transfer of knowledge. It has also contributed to joint research projects and communication for increasing social awareness on its domains, mainly focused on capacity building activities. Hosted by the University of Trás-os-Montes e Alto Douro (UTAD), Vila Real, Portugal, this UNESCO Chair includes also the Agostinho Neto University (Angola), Nacional de Tucuman University (Argentina), Federal de Pernambuco (Brazil), Universidade Regional do Cariri (Brazil), Universidad de Atacama (Chile), Regional Amazônica University (Ecuador), National Autonomous University of Mexico (Mexico), Autonomous University of San Luis Potosi (Mexico), Eduardo Mondlane University (Mozambique), Complutense University (Spain). It has also the support of UNESCO through its Regional Office of Eastern Africa, and its Regional Bureau for Science in Latin America and the Caribbean, and the Portuguese NatCom, among other institutions of research and private sector. It is important to highlight one of the most important outputs of this UNESCO Chair: the organization of an annual International Summer University, which has already counted with five editions. This Summer University, supported by the secretariat of the UNITWIN Programme and promoted by the International Geoscience and Geoparks Programme (IGGP) of UNESCO, has gathered along these five past years more than 500 participants, 130 invited-speakers, many of them from other UNESCO Global Geoparks around the world, and involved people from 80 countries. This Summer University continued even during the COVID-19 pandemic, but on an online format. Nevertheless, it was possible to have 360 participants, 24 invited speakers, all of them coming from a total of 63 countries. In the emblematic celebration of its fifth anniversary, it was also possible to have a representative from the UNITWIN Programme, and simultaneously from the Future of Learning and Innovation Initiative of UNESCO. This was a very important milestone in this positive partnership since in November 2021 UNESCO intends to publish a report designed to share a forward-looking vision of what education and learning might yet become and offer a policy agenda. As mentioned during the main lecture, this initiative will catalyze a global debate on how knowledge and learning can shape the future of Humanity and the Planet. In this sense, this new initiative has a common vision also shared by the UNESCO Chair on Geoparks, Regional Sustainable Development, and Healthy Lifestyles, which is “knowledge and learning are humanity’s greatest renewable resources for responding to challenges and inventing alternatives. Yet, education does more than respond to a changing world. Education transforms the world”.

**Keywords:** UNESCO Chair, UNESCO Global Geoparks, Transfer of Knowledge, Capacity-Building, Education

**Corresponding author:** asa@utad.pt

**Reference:**

SÁ, A., SILVA, E., GABRIEL, R. & MOREIRA, H. (2016). The case of the UNESCO Chair “Geoparks, Regional Sustainable Development and Healthy Lifestyles” – a strong contribution for capacity building in Geoparks. Abstract Book of the 7th International Conference on UNESCO Global Geoparks, Torbay, England, 294. SÁ, A.A., SILVA, E., GABRIEL, R., MOREIRA, H. & CRISTÓVÃO, A. (2016). UNESCO Chair “Geoparks, Regional Sustainable Development and Healthy Lifestyles”: an innovative tool for capacity building in geoparks. 35th International Geological Congress Abstracts. Cape Town, South Africa, Record ID 0784682095 (GEOREF, American Geoscience Institute).

## Morphodynamics Of Víkurfjara Beach, South Iceland

*Jóhannes M. JÓHANNESSON<sup>1\*</sup>,  
Katla UNESCO Global Geopark<sup>1</sup> Iceland*

Katla UNESCO Global Geopark Víkurfjara beach is a sandy to gravel, high energy, wave dominated beach in front of the town of Vík, South Iceland. The beach faces to the south and is exposed to one of the highest wave energy in Iceland during frequent storms with highest wave energy from the south-west and to lesser extent from the south-east. The beach is a young formation, being built up since the 17th century by successive glacial outburst floods in connection with eruptions underneath the icecap of Mýrdalsjökull, in the caldera of Katla volcano, as well as by along shore movement of sediments from large glacial rivers both east and west of the area. During the last glacial outburst flood in 1918, the coastline east of Víkurfjara extended up to several kilometers. In the decades that follow, sediments from this extension were rapidly redistributed and extended the Víkurfjara beach by a few hundred meters. Once the extension stabilized, erosion followed of the entire coastline, including Víkurfjara. In order to stop the erosion two sand collectors were built on the beach effectively dividing the beach into three segments. To monitor the beach, and evaluate the efficiency of the sand collectors, eleven profiles were put up on Víkurfjara in January and February 2021. Nine out of the eleven profiles are measured monthly, with two of them measured only during large scale events. The nine profiles are distributed over the three segments, with two profiles being between the 2011 collector and Reynisfjall mountain, five profiles between the two collectors and 2 profiles east of the 2017 collector. The measurements show that the western part of the beach is stable, the middle sector is yet not stable and erosion occurs there regularly, and the eastern sector is still unprotected and erosion is high there. This Geopark and Geoschool activity has led to a national wide attention, especially in the educational circles, and along with getting important scientific data that is being shared with appropriate agencies, the students are getting lessons in scientific method that will help them in their future studies.

**Keywords:** Iceland, Víkurfjara Beach, Coastal erosion, Beach profiles, Sand

**Corresponding author:** johannes@katlageopark.is

**Reference:**

[www.katlageopark.com/](http://www.katlageopark.com/)

## Markers, to shift paradigm !

*Christophe LANSIGU<sup>1\*</sup>,  
Massif des Bauges UGGp<sup>1</sup> France*

Mineral resources consumption is, for general public, a blind spot of consumer society. While people's hunger of goods and novelties is currently viewed as the engine of economy and well-being, its link with rocks consumption and mobilizable resources is largely unrecognized. In order to advise and involve the population into resources management through their consumer choices, we need a neutral and objective information sheltered from interest groups. UNESCO Global Geoparks are appropriate places to make the link between our lifestyles and rocks consumption that represents the diversity of our earth but also constitutes a finite capital. This task belongs to UGGps mission and responsibility to connect Man and Earth. A cycle of public presentations has been held for three years in the Massif des Bauges UGGp to connect everyday objects and minerals resources implicated in their making. Examples of very common objects like glasses, PVC's chairs and tables or cement are discussed. Unexpected uses of rock in common products like beer and wine are presented. More complex materials proposed by industry in manufactured goods are evocated, like aluminium in uses as varied as beverage cans, car bodywork, or laptop computer cases. The entire supply chain of fabrication is mentioned, from the location of iconic mines all around the world, virtually visited with google earth, to the energetic cost of transformation. People are very attracted by the opportunity to give a geographic reality to this supply chain and are usually amazed by the amount of energy implied by this manufacturing made in their name. Strategic metals and materiel and their applications into high technologies developments are also evocated: Rare earth elements, from their extraction to their uses in smartphones, information and renewable energy technologies. Silicium, Lithium, uranium are also briefly presented to distinguish natural deposits and separation and purification processes: from a quartz pebble to free (metal) silicium as it's producted near our area! Presented in the double frame of national days of geology (organized by the French geological society) and national sciences festival, this ludic approach is based on a review of everyday objects. The objective is to make discover or guess how things or materials are made. This is the pretext to explore, at a time, technological prowesses, geological heritage and international supply routes. An occasion to balance the state of resources stocks and technological challenge to ease of, or to adapt to climate change. An opportunity to make the public interrogate itself, without judgement, on the goods it consumes and their ecological footprint, to allow the audience to act as informed citizens.

**Keywords:** mineral resources, applied geology, conference, geopark role, goods

**Corresponding author:** c.lansigu@parcdesbauges.com

**Reference:**

## Society and Science: Geoheritage Education at Stonehammer Geopark

*Catrina RUSSELL<sup>1\*</sup>,  
Stonehammer UNESCO Global Geopark<sup>1</sup> Canada*

Upon recognizing a need for quality geoscience education in New Brunswick, Stonehammer Geopark began to offer programs for students as well as workshops for teachers. These were developed with the provincial curriculum in mind, focusing on the two grade levels that call for geoscience literacy. Recently, these offerings have been expanded on in order to engage students across all grade levels and subject areas using a more holistic approach. Focusing on topics that students and teachers are already familiar with acts as a gateway to introduce related geoscience concepts. The subject of geoheritage has proven to have a particular appeal. This interdisciplinary theme provides the opportunity to explore the region's early communities and their deep connections to the land. New Stonehammer offerings, including a virtual geoheritage program that weaves together topics of indigenous culture and custom with the region's geological history, as well as a short video exploring themes of geologic exploration and discovery in the region are now available to every student in New Brunswick.

**Keywords:** Geoscience, Geoheritage, Education, Interpretation

**Corresponding author:** [catrina@stonehammergeopark.com](mailto:catrina@stonehammergeopark.com)

**Reference:**

Tormey, D., 2019. New approaches to communication and education through geoheritage. *International Journal of Geoheritage and Parks*, Volume 7, Issue 4, Pages 192-198.

## Discovering 'Discovery': Using Local Paleontology and Geology to Inspire Students to Become Custodians of Their Geological Heritage

Christopher MCKEAN<sup>1\*</sup>, Edith SAMSON<sup>2</sup>, Shawna PRINCE<sup>3</sup>, Bonnie COOLE<sup>4</sup>, Duncan MCILROY<sup>1</sup>,

*Department of Earth Sciences, Memorial University of Newfoundland, St. John's, NL, A1C 3X5<sup>1</sup> Canada, Sir William Ford Coaker Heritage Foundation Inc., Port Union, NL, A0C2J0<sup>2</sup> Canada, Sea of Whales Adventures, Trinity, NL, A0C2S0<sup>3</sup> Canada, Catalina Elementary School, Catalina, NL, A0C1J0<sup>4</sup> Canada, Department of Earth Sciences, Memorial University of Newfoundland, St. John's, NL, A1C3X5<sup>1</sup> Canada*

Discovery UNESCO Global Geopark is located on the Bonavista Peninsula in Eastern Newfoundland and is composed of sedimentary and extrusive volcanic rocks deposited approximately 565 Ma. These rocks contain some of the oldest examples of the enigmatic Ediacaran biota, the earliest known complex macrofossils on Earth, alongside the oldest definitive animal fossil discovered – *Hootia quadriformis*. The unique geology and paleontological history of the area allows for experiential scientific engagement with the public, youth clubs and schools found across the 27 towns and communities within Discovery. With funding from Discovery and Memorial University a public engagement initiative focusing on Geoeducation, Geotourism, and Geoheritage and Geoconservation has been developed and is now being rolled out across the area. By working with the schools in the geopark, and youth groups such as the Brownies and Girl Guides, the aim is to inspire students ranging from Kindergarten to Grade 12 through a range of talks and fun art-based scientific activities focused on the geology and paleontology of the area, as well as informing them on the work conducted by a global community of scientists on their front doorstep. This will be developed further in the future by designing hikes to easily accessible localities from each school and the inclusion of local specimens and locations into the science syllabus, to supplement the lesson plans set out in the Newfoundland and Labrador school curriculum – with a focus on the 'Rocks, Minerals and Erosion', 'Earth's Crust' and 'Diversity of Life' units. By working with the community, as well as developing these educational tools for use in schools across the geopark, the ultimate goal is to inspire a lifelong interest in science for many of these students, as well as for them to become future custodians of the sites within the geopark. Therefore, protecting these sites for both future generations and the scientific community, which will lead to further developments in our understanding of the early history of life on Earth.

**Keywords:** Newfoundland, Geopark, Ediacaran biota, Precambrian, Scientific Communication

**Corresponding author:** cmckean@mun.ca

**Reference:**

Hofmann, H.J., O'Brien, S.J. and King, A.F. 2008. Ediacaran biota on Bonavista Peninsula, Newfoundland, Canada. *Journal of Paleontology*, 82, 1–36. Liu, A.G., Matthews, J.J., Menon, L.R., McIlroy, D. and Brasier, M.D. 2014. *Hootia quadriformis* n. gen., n. sp., interpreted as a muscular cnidarian impression from the Late Ediacaran period (approx. 560 Ma). *Proc. R. Soc. B*, 281, 20141202. Matthews, J.J., Liu, A.G., Yang, C., McIlroy, D., Levell, B. and Condon, D.J. 2020. A Chronostratigraphic Framework for the Rise of the Ediacaran Macrobiota: New Constraints from Mistaken Point Ecological Reserve, Newfoundland. *GSA Bulletin*, 133, 612–624.

## Environmental Education: Geopark and Upper Secondary School Co-operation

*Kaisa TÖRMÄ<sup>1\*</sup>, Kalle MÄNNISTÖ<sup>2</sup>,*

*Lauhanvuori-Hämeen kangas UNESCO Global Geopark, Kankaanpää Upper Secondary School<sup>1</sup> Finland,*

*Lauhanvuori-Hämeen kangas UNESCO Global, Honkajoki Upper Secondary School<sup>2</sup> Finland*

UNESCO Global Geopark is situated in western Finland, in the southern part of Suomenselkä, a region separating Ostrobothnia from the southern and eastern lake regions of Finland. The geological theme of the Geopark is the development from an ancient mountain range to the landscape of vast open mires we see today. Honkajoki Upper Secondary School is located in the heart of the UNESCO Global Geopark Lauhanvuori-Hämeen kangas, which has created a framework for mutual collaboration in environmental education since 2015. In spring 2021 the construction work of a new school building customized for the needs of environmental education was finished in Honkajoki. The school building is equipped with e.g. solar panels and a weather station, and the school yard is practically a food plant garden. The building and its surroundings are constantly being developed according to their usability in environmental education. Environmental education is included as transversal competences in the Finnish National Curriculum for Secondary Education and the contents are embedded in various subjects. In addition to the National Curriculum, environmental education is included in the local curriculum of Honkajoki Upper Secondary School in form of various courses that are offered to students in close collaboration with the UNESCO Global Geopark Lauhanvuori-Hämeen kangas, polytechnics and universities, e.g. the GeoRanger –training programme. Honkajoki Upper Secondary School puts environmental education into practice. The local Motordrome has witnessed a landscaping project, during which students have created sunlit areas in order to protect the biodiversity of sunlit environments. Students have planted meadows and pastures in the school surroundings and produced guide signs with artificial reality. Students plant trees and cultivate vegetables in food plant garden. In addition to this, scientific field trips in Geopark are carried out on a regular basis. Students gather and analyze samples e.g. from the mire. The common vision of the local Upper Secondary School education, L-H Geopark and the local actors is to create a Geo-Education Portal in the new Honkajoki school building. It would serve as a centre of environmental education for the schools in the area, tourists, and it could be a destination for international school camps.

**Keywords:** environmental education, Geopark, Honkajoki Upper Secondary School, meadow, school garden weather station

**Corresponding author:** [kaisa.torma@kankaanpaa.fi](mailto:kaisa.torma@kankaanpaa.fi), [kalle.mannisto@kankaanpaa.fi](mailto:kalle.mannisto@kankaanpaa.fi)

**Reference:**

Kalle MÄNNISTÖ, Honkajoki Upper Secondary School Kaisa TÖRMÄ, Kankaanpää Upper Secondary School

## The Growth of an Ecological Agricultural Corporation within Huanggang Dabieshan UNESCO Global Geopark, China

*Li FENG<sup>1\*</sup>,*

*Huanggang Dabieshan UGGp, China<sup>1</sup> China*

After the newly-labeled Huanggang Dabieshan UNESCO Global Geopark in 2018, Waipoqiao Ecological Agricultural Development Corporation, which focuses on environmental friendly agricultural picking and integrates aquaculture industry, Morchella esculenta cultivation, farming, catering and accommodation as a whole, is an ecological agricultural farm where you will sure have an unforgettable rural experience. Due to the suitable climate and soil quality, so far the company has built "one center and four bases", including a large square of Morchella esculenta planting base and other breeding bases. By applying the mode of "Company+collective agricultural enterprise+base+peasant household", the company has only 30 permanent employees, including some technical workers and agricultural scientists, but brings to the prosperity of more than 5 villages within the surrounding areas. Being a partner of Huanggang Dabieshan UNESCO Global Geopark, they devotes to actively driving the development of village collective economy and benefiting local community, so as to be a typical representative to the development of local economy, to achieve mutual benefit, such as to improve local residents' sense of participation, interaction and pride, in addition actively participate in the protection and development of Huanggang Dabieshan UNESCO Global Geopark.

**Keywords:** ecological agriculture, local community, base, mode, geopark

**Corresponding author:** 531851997@qq.com

**Reference:**

Huanggang Dabieshan UNESCO Global Geopark, China, Waipoqiao Ecological Agricultural Development Corporation.

## Development of Geological Tourism of Shennongjia UNESCO Global Geopark

Qian CHEN<sup>1\*</sup>,

China University of Geosciences, Wuhan<sup>1</sup> China

Hubei Shennong Tourism Investment Group Co., Ltd. is franchised to be engaged in the geological tourism, and has invested 500 million yuan to build scenic spots including Shennongding, Guanmenshan, Tianyan, Dajiuhu, Tianshengqiao (Natural Bridge), Shennong Altar, Taiheshan, showcasing the perfect integration of geology, ecology and culture. The geotourism industry has achieved unprecedented development, with the revenue growing at a rate of 30% per year. In 2019, a total of 3,584,400 tourists were received. The contribution of geotourism to the local economy reached 1.8 billion yuan. 65% of the towns and 75% of the population directly benefited from the tourism industry, with nearly 400 agritainment resorts, nearly 20 hotels and restaurants with stars, and more than 7,000 people directly engaged in the geotourism industry. 20,000 people have indirectly served and benefited from tourism. The Geopark implements network promotion and marketing and builds e-commerce, direct sales platform and distribution platform. In terms of outbound marketing, the Geopark has cooperated with 80 travel agencies in product sales and established cooperation with 27 top-100 travel agencies to sign agreements for businesses associated with local travel agencies, express buses and individual traveler groups. In addition, it has held special tourism promotion activities and festivals.

**Keywords:** Hubei province, Shennongjia UNESCO Global Geopark, geological tourism, sustainable development, economy

**Corresponding author:** chenqian@cug.edu.cn

**Reference:**

1. Azman, N.; Halim, S. A.; Liu, O. P.; Komoo, I., The Langkawi Global Geopark: local community's perspectives on public education. *International Journal of Heritage Studies* 2011, 17, (3), 261-279.
2. de Carvalho, C. N. In *Tourism in the Naturtejo Geopark, Under the Auspices of UNESCO, as Sustainable Alternative to the Mining of Uranium at Nisa (Portugal)*, International Workshop on Uranium, Environment and Public Health (UrEnv), Castelo Branco, PORTUGAL, Oct 25, 2013; Castelo Branco, PORTUGAL, 2013; pp 86-92.
3. Drapela, E.; Buchner, J. In *NEISSELAND GEOPARK: CONCEPT, PURPOSE AND ROLE IN PROMOTING SUSTAINABLE TOURISM*, Conference on Public Recreation and Landscape Protection-With Sense Hand in Hand.. Czech Soc Landscape Engineers, Krtiny, CZECH REPUBLIC, May 13-15, 2019; Czech Soc Landscape Engineers, Krtiny, CZECH REPUBLIC, 2019; pp 268-272.
4. Guo, W.; Chung, S. S., Using Tourism Carrying Capacity to Strengthen UNESCO Global Geopark Management in Hong Kong. *Geoheritage* 2019, 11, (1), 193-205.
5. He, F. Y.; Zhang, Y.; Peng, P. H. In *A Study on Measurement of Tourism Environmental Carrying Capacity of Geoparks-a Case study of Xinwen Karst World Geopark*, 2nd International Conference on Energy and Environmental Protection (ICEEP 2013), Guilin, PEOPLES R CHINA, Apr 19-21, 2013; Guilin, PEOPLES R CHINA, 2013; pp 4061-+. 6. Jones, T. E., Evolving approaches to volcanic tourism crisis management: An investigation of long-term recovery models at Toya-Uzu Geopark. *Journal of Hospitality and Tourism Management* 2016, 28, 31-40.
7. Liu, F. J.; Zeng, H.; Guo, G. L. In *Study on Tourism Environmental*

Carrying Capacity of Mt. Longhushan World Geopark, Conference on Geology Resource Management and Sustainable Development, Lushan, PEOPLES R CHINA, Nov, 2009; Lushan, PEOPLES R CHINA, 2009; pp 382-386. 8. Luo, Y. Y.; Mou, Y.; Wang, Z.; Su, Z. R.; Qin, Y., Scenario- based planning for a dynamic tourism system with carbon footprint analysis: A case study of Xingwen Global Geopark, China. *Journal of Cleaner Production* 2020, 254. 9. Moreira, J. C.; do Vale, T. F.; Burns, R. C., Fernando de Noronha Archipelago (Brazil): A Coastal Geopark Proposal to Foster the Local Economy, Tourism and Sustainability. *Water* 2021, 13, (11). 10. Ozgeris, M.; Karahan, F., Use of geopark resource values for a sustainable tourism: a case study from Turkey (Cittaslow Uzundere). *Environment Development and Sustainability* 2021, 23, (3), 4270-4284. 11. Paskova, M. In *The potential of indigenous knowledge for Rio Coco Geopark Geotourism*, 1st World Multidisciplinary Earth Sciences Symposium (WMESS), Prague, CZECH REPUBLIC, Sep 07-11, 2015; Prague, CZECH REPUBLIC, 2015; pp 886-891. 12. Qiu, W. L.; Lei, F. In *Study on Geopark in Jiangxi Tourism Sustainable Development Innovation Model*, Conference on Geology Resource Management and Sustainable Development, Lushan, PEOPLES R CHINA, Nov, 2009; Lushan, PEOPLES R CHINA, 2009; pp 361-366. 13. Shui, W.; Xu, G. W., Analysis of the influential factors for changes to land use in China's Xingwen Global Geopark against a tourism development background. *Geocarto International* 2016, 31, (1), 22-41. 14. Wang, Y. H.; Wu, F. D.; Xu, Y. Y. In *Research on Geological Tourism Resources of Lingchuan-Wangmangling National Geopark*, International Conference on Applied Mechanics and Materials (ICAMM 2012), Sanya, PEOPLES R CHINA, Nov 24-25, 2012; Sanya, PEOPLES R CHINA, 2012; pp 2797-2802. 15. Zheng, X. P. In *Research on Dragon and Tiger Mountain Geopark Tourism Sustainable Development*, 2nd Academic Conference of Geology Resource Management and Sustainable Development, Lushan, PEOPLES R CHINA, Aug, 2010; Lushan, PEOPLES R CHINA, 2010; pp 111-114.

## Toba Caldera Geopark: The Opportunities and Challenges in Coping with Environmental Degradation

*Betti Betharia S. NAIBAHO<sup>1\*</sup>, Shew Jiuan SU<sup>1</sup>,*

*National Taiwan Normal University<sup>1</sup> Indonesia, National Taiwan Normal University<sup>1</sup> Taiwan Province of China*

Despite has been included in the Ten New Bali program or Ten Super Priority Destination for tourism development in Indonesia and accepted as a member of UNESCO Global Geopark in 2020, Lake Toba is still struggling with environmental degradation. As a common pool resource, environmental degradation is one of the biggest challenges in conserving Lake Toba, which goals should save for the common good. Nevertheless, being included in the Ten New Bali program and accepted as a member of UGGp could be the best opportunity to save the lake from degradation, particularly by implementing the three main pillars of Geopark: education, conservation, and promotion of the local economy. This research aims to investigate how the opportunities and challenges in coping with environmental degradation in the Lake Toba area could be made possible based on geopark practices. The data was collected since 2017 through direct interviews, online interviews, literature studies, and observation by focusing on the situation before and after the acceptance of Toba Caldera Geopark as a member of UGGp. For implementing Geopark with common benefit and environmental integrity, strengthening the involvement of the local community by targeting all 'micro-communities should be highly considered. The local people are known for their various 'micro-communities based on clan, occupation, churches, interests, and many more. People see these micro-communities as reliable, and approaching them through these micro-communities will be effective. Further, as the sixteen geosites of Toba Caldera Geopark are spread in seven districts surrounding Lake Toba, cooperation among the seven districts should be considered. However, as many local people depend their livelihood on Lake Toba's ecosystem services, diversifying economic activity should be the priority.

**Keywords:** Lake Toba, Geopark, common-pool resource, environmental degradation, local community

**Corresponding author:** betti.naibaho@gmail.com

**Reference:**

Alves-Pinto, H. N., Latawiec, A. E., Strassburg, B. B. N., Barros, F. S. M., Sansevero, J. B. B., Iribarrem, A., ...Silva, A. C. P. (2017). Reconciling rural development and ecological restoration: Strategies and policy recommendations for the Brazilian Atlantic Forest. *Land Use Policy*, 60, 419–426. <https://doi.org/10.1016/j.landusepol.2016.08.004> Bangun, M., &Junita, D. (2020). Strategi Pengembangan Kawasan Geosite Kaldera Toba Pasca Penetapan Sebagai UNESCO Global Geopark (The Strategy for Development of the Toba Caldera Geosite Area after the Designation as a UNESCO Global Geopark.). *Jurnal Ilmiah Ilmu Komunikasi*, 5(2), 213–225. Carr, A., Ruhanen, L., &Whitford, M. (2016). Indigenous peoples and tourism: the challenges and opportunities for sustainable tourism.

- Journal of Sustainable Tourism, 24(8–9), 1067–1079. <https://doi.org/10.1080/09669582.2016.1206112>
- Chesner, C. A. (2012). The Toba Caldera Complex. *Quaternary International*, 258, 5–18. <https://doi.org/10.1016/j.quaint.2011.09.025>
- Farsani, N. T., Coelho, C., & Costa, C. (2012). Geotourism and Geoparks as Gateways to Socio-cultural Sustainability in Qeshm Rural Areas, Iran. *Asia Pacific Journal of Tourism Research*, 17(1), 30–48. <https://doi.org/10.1080/10941665.2011.610145>
- Frischmann, B. M., Marciano, A., & Ramello, G. B. (2019). Retrospectives tragedy of the commons after 50 years. *Journal of Economic Perspectives*, 33(4), 211–228. <https://doi.org/10.1257/jep.33.4.211>
- Ginting, N., & Sasmita, A. (2018). Developing tourism facilities based on geotourism in Silalahi Village, Geopark Toba Caldera. *IOP Conference Series: Earth and Environmental Science*, 126(1). <https://doi.org/10.1088/1755-1315/126/1/012163>
- Gultom, T., Azwar, E., Siregar, N. S., & Surbakti, R. P. (2019). Analisis Pengetahuan Masyarakat Tentang Geopark Kaldera Toba dan Tumbuhan Endemik di Sumatera utara (Analysis of Community Knowledge About Toba Caldera Geopark and Endemic Plants in North Sumatra). *VISI*, 27(2), 4087–4099.
- Hutauruk, M., Nasution, Z., & Purwoko, A. (2018). Youth Participation in Geopark Kaldera Toba Tourism and Economic Development ( Case Study: Toba Samosir ). *International Journal of Research*, 05(20).
- Marbun, S. F., Muta'ali, L., & Sudrajat. (2019). Pengembangan Kawasan Geopark Kaldera Toba di Kabupaten Samosir (Development of The Geopark Kaldera Toba Area in Samosir District). *Jurnal Sains Informasi Geografi*, 2(2), 18–23. <https://doi.org/10.31314/jsig.v2i2.281>
- Ostrom, E. (1990). *Governing the commons: the evolution of institutions for collective action*. Cambridge: Cambridge University Press.
- Ostrom, E. (2002). Reformulating the commons. *Ambiente & Sociedade*, 6(10), 5–25. <https://doi.org/10.1590/s1414-753x2002000100002>
- Ostrom, E., Burger, J., Field, C. B., Norgaard, R. B., & Policansky, D. (1999). Revisiting the commons: Local lessons, global challenges. *Science*, 284(5412), 278–282. <https://doi.org/10.1126/science.284.5412.278>
- Rose, C. M. (2020). Thinking about the commons. *International Journal of the Commons*, 14(1), 557–566. <https://doi.org/10.5334/ijc.987>
- Sangha, K. K., Preece, L., Villarreal-Rosas, J., Kegamba, J. J., Paudyal, K., Warmenhoven, T., & RamaKrishnan, P. S. (2018). An ecosystem services framework to evaluate indigenous and local peoples' connections with nature. *Ecosystem Services*, 31, 111–125. <https://doi.org/10.1016/j.ecoser.2018.03.017>
- Suzuki, D. A., & Takagi, H. (2018). Evaluation of Geosite for Sustainable Planning and Management in Geotourism. *Geoheritage*, 10(1), 123–135. <https://doi.org/10.1007/s12371-017-0225-4>
- Wal Hidayat, T., & Nasution, I. (2019). Persepsi Publik Tentang Destinasi Pariwisata Danau Toba Sebagai Global Geopark Kaldera UNESCO (Public Perceptions of Lake Toba Tourism Destinations as UNESCO Caldera Global Geoparks). *Publikauma: Jurnal Administrasi Publik Universitas Medan Area*, 7(2), 88. <https://doi.org/10.31289/publika.v7i2.2943>

## Implement of Cross-Curricular Learning Education Program Based on Geopark in Muroto UNESCO Global Geopark, Japan

*Tsubasa OGASAWARA<sup>1\*</sup>, Aya OWADA<sup>2</sup>,*

*Muroto Geopark Promotion Committee<sup>1</sup> Japan, Kochi Prefectural Muroto HighSchool<sup>2</sup> Japan*

This presentation will talk about the process how Geopark education has been developed in a local high school in Muroto UNESCO Global Geopark (MUGP, hereafter) in the last 10 years. When MUGP was designated as Global Geopark in 2011, Muroto High School launched "Geopark Studies" as its official curriculum and Geopark geologist and geographer regularly gave a class since then. It was a big progress for MUGP at that time. It has been 10 years and a new challenge has been found: only a few school teachers in science and social studies have involved into Geopark so that Geopark has not been a "whole school project." MUGP, therefore, works more closely with school teachers to develop cross-curriculum program based on Geopark. Two projects have already launched in this school year experimentally; 1) Geohazard risk reduction measurement in a math class: calculating the safest time length and doing field investigation to evacuate from Tsunami, 2) developing universal-designed guided tour by collaborating students in Geopark Studies and social welfare class. In Japan, public school develops class curriculum based on the government course guideline issued by Ministry of Education, Course, Sports, Science and Technology (MEXT) which mentions Geopark is one of key areas to achieve an educational goal. Therefore, MUGP and Geoparks in Japan develop its education program based on the course guideline. This presentation will also share how MUGP develops education programs based on the guideline for more effective implementation of Geo-education.

**Keywords:** Geo-Education, Cross-curricular learning, Collaborated geo-education program with local high school

**Corresponding author:** tsubasa@muroto-geo.jp

**Reference:**

1. Ministry of Education, Course, Sports, Science and Technology, "New Government Course Guideline," [https://www.mext.go.jp/a\\_menu/shotou/new-cs/](https://www.mext.go.jp/a_menu/shotou/new-cs/) (Retrieved 2021 September 24th)

## Revitalizing Cultivated Land on a Marine Terrace

Narimi WADA<sup>1\*</sup>,

Muroto Geopark Promotion Committee<sup>1</sup> Japan

Farmers around Muroto UNESCO Global Geopark (MUGP, hereafter) area are facing the problem of difficulty in harvesting crops and labor shortages due to population aging. Therefore, MUGP has planned and implemented hands-on activities that specifically focuses on resolving their concerns. The Nishiyama Plateau, which is known as beautiful marine terraces, is famous not only as beautiful topography but also as an agricultural land. Due to its topography, this area gets plenty of sunlight and have well-drained soil. Among the crops harvested there, citrus fruits are famous nationwide. Ponkan orange (*Citrus poonensis hort.*) is a popular type of citrus around this area and so, MUGP and a local farmer created a citrus harvesting activity which utilizes these ponkan oranges. It was expected that this activity program would be effective in two things; 1) work efficiency will increase because the work normally done by one person, is done by multiple people, 2) producers profit will be increased by selling "the experience." We collaborated with one of the producers who runs the farm in Nishiyama Plateau. Here, we held a 2-hour activity program twice, with a maximum of 4 participants per program. Due to the COVID-19 situation, the number of participants were small and all were residents of Muroto City. As a result, 1) work efficiency did not increase even though we had several participants, and 2) detailed explanation about the plants characteristics and habitat improved participant's curiosity for agricultural products in the tour. 3) By harvesting these ponkan before it was fully ripe, participants were able to experience the "ripening" process of the citrus at home which normally happens at the farm. Improving the work efficiency, which was one of the aims, could not be implemented this time. However, participant's interest in agriculture and agricultural products significantly increased through this experience. In the future, we plan to develop and implement a hands-on experience program aiming to solve producers concerns on the Nishiyama Plateau. We will also like to take measures to incorporate not only the geomorphological point of view, but also the historical and cultural aspects into the tour in order to share the 200-years cultivation history on Nishiyama Plateau. It will increase the value of our experience program as a product and aim to develop sustainable tourism resources that are unique to MUGP.

**Keywords:** population aging, hands-on activity, solve producers concerns, Nishiyama Plateau, marine terrace

**Corresponding author:** narimiwada@muroto-geo.jp

**Reference:**

Muroto Geopark Promotion Committee, "Progresss Report 2016-2019," 2019 January

## SAFE TOURISM AFTER COVID-19, EXAMPLES IN THE SOUTH-CENTRAL COAST OF VIETNAM

Chi HOANG THI PHUONG<sup>1\*</sup>, Nam NGUYEN THI QUE<sup>1</sup>, Hai HA QUANG<sup>1</sup>,

University of Science, Vietnam national university Ho Chi Minh city<sup>1</sup> Vietnam, University of Science, Vietnam national university Ho Chi Minhcity<sup>1</sup> Vietnam, University of Science, Vietnam national university Ho Chi Minhcity<sup>1</sup> Vietnam

The coastal area of South-central Vietnam, which has many geosites with high scientific and additional values, attracts tourists all over the world. Travel and tourism are among the most affected sectors due to the COVID-19 pandemic. To gradually recovering tourism, this research proposes geotrails as safe and sustainable solutions. Geotrails are routes or pathways which have strong links among abiotic, biotic and culture of destinations. Those were proposed including representative geotrails: 1) Cycling follow the lava flow in Ly Son island (from Hang Cau cliff to To Vo Arch); 2) Trekking through diverse geomorphosites in Nui Chua National Park (from the coast of Rai Cave to the top of Co Tuy Mountain); 3) Boating to the late Proterozoic to early Paleozoic metamorphic rocky coast in Tam Hai tombolo. Supporting by other geoproducts such as geoinformation, geoactivities, geofoods, geogifts with hygiene quality, geotrails would be safe tourism solutions that are guaranteed by the 5K rule of the Ministry of Health of Vietnam after the pandemic.

**Keywords:** geotrail, COVID-19, geotourism, South-central coast of Vietnam

**Corresponding author:** [htpch@hcmus.edu.vn](mailto:htpch@hcmus.edu.vn)

**Reference:**

1. Bob Campbell, Lynda Jones (2013) The Living earth. Cradle Coast GeoTrail
2. Dryglas D, Krzysztof M (2014) Construction of the Geotourism product structure on the example of Poland Ginting N, Siregar N (2018) Geotrail development to connect the dots in Muara Caldera Toba, Indonesia. IOP Conf Ser: Earth Environ Sci 126:012169. <https://doi.org/10.1088/1755-1315/126/1/012169>
3. Middleton VTC, Fyall A, Morgan M (2009) Marketing in travel and tourism, 4th ed. Butterworth-Heinemann, Amsterdam; Boston; London
4. Reynard E (2008) Scientific research and tourist promotion of geomorphological heritage. Geogr Fis Dinam Quat 225–230
5. Reynard E, G. Fontana, L. Kozlik, C. Scapozza (2007) A method for assessing “scientific” and “additional values” of geomorphosites. Geographica Helvetica 62:148–158. <https://doi.org/10.5194/gh-62-148-2007>
6. Reynard E, Perret A, Bussard J, et al (2016) Integrated Approach for the Inventory and Management of Geomorphological Heritage at the Regional Scale. Geoheritage 8:43–60. <https://doi.org/10.1007/s12371-015-0153-0>
7. Ross Dowling (2018) Geotrails. Australian Geoscience Council Convention. Big Issues and ideas in Geoscience. 14-18 October 2018.

## Developing Community-Based Tourism Model In Dak Nong UNESCO Global Geopark

*Van TRAN NHI BACH<sup>1\*</sup>,  
Dak Nong UNESCO Global Geopark<sup>1</sup> Vietnam*

One of the mandatory missions of a UNESCO Global Geopark is to promote its communities' roles and responsibilities for preserving and promoting its heritage values. Therefore, developing community-based tourism appears to be an appropriate approach to enhance local participation, meeting the Global Geoparks Network's requirements. This type of tourism not only helps to gain the local people's sense of belonging to the geopark but also brings the most authentic and interesting experiences on local daily life to visitors. With those goals, Dak Nong UNESCO Global Geopark Management Board (MB) has piloted a community-based tourism (CBT) model associated with the geopark's unique values in Ea Po commune (Cu Jut district). Through educating and training related knowledge of the geopark and tourism-related soft skills, the local community has been empowered to play an active role in sustainable tourism development. This model is considered a nuclear model to stimulate and spread its dynamics to other localities within the geopark for a future sustainable socio-economic development of the whole province.

**Keywords:** Dak Nong Geopark, community-base, tourism, sustainability, local empowerment

**Corresponding author:** bachvan.trannhi@gmail.com

**Reference:**

<https://daknonggeopark.com/>

## Establishment Of Wugongshan Aspiring UNESCO Global Geopark And Local Sustainable Development

*Peng FENG<sup>1</sup>,*

*Wugongshan Aspiring UNESCO Global Geopark<sup>1</sup> China*

In recent years, Wugongshan Geopark has developed tourism industry, promoted social and economic development, lifted local people out of poverty, by 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. At the same time, it has carried out service facilities construction, strengthened geological heritage protection and popular science publicity, Achieve sustainable development. In January 2020, it has become one of the candidate sites of China to apply for UNESCO Global Geoparks.

**Keywords:** Wugongshan Aspiring UNESCO Global Geopark, Poverty Alleviation, Sustainable Development

**Corresponding author:** 827003123@qq.com

**Reference:**

[1]Lin W, Li J Y. Cretaceous two stage extensional tectonic in eastern Eurasia continent and its geodynamics. *Acta Petrologica Sinica*, 2021, 37(8): 2303-2323. [2]Liu Kai,Zhang Yaoyao, He Qingcheng. Pearl under the dome -- hot spring chain around Wugongshan.Knowledge is power, 2021, 66-69.

## Geopark education and sustainable development in Non nuoc Cao Bang UNESCO global geopark

*Thuy LY<sup>1\*</sup>,*

*Non nuoc Cao Bang UNESCO global geopark<sup>1</sup> Vietnam*

Geopark education is one of the key components in the development of Non nuoc Cao Bang UGGp and It has been implemented in all schools in geopark territory. It is also indicated that geopark education is extremely important in heritage preservation and sustainable development in the future. Geopark education has been implemented in schools in Non nuoc Cao Bang geopark territory since 2017 through various activities, such as: Extracurricular sessions (drawing contests, presentation contests, traditional costume performances, wall-newspaper contests, folk-song singing contests, etc); environmental protection activities, making communication and propaganda clips and uploading on social media, participating in field learning experience trips, organizing geopark picture exhibitions, etc. In order to increase effectiveness of Geopark education activity in school, Management board of Non nuoc Cao Bang UGGp cooperated with Department of Education and training to implement "Geopark ambassador club" model which was piloted in 06 selected schools at the end of 2019. This presentation focuses on the foundation and the operation of « Geopark Ambassador club » model. Moreover, it also aims at the purpose and the effectiveness from taking part in the model. The results indicated that students are really excited in participating these activities and willing to join heritage preservation in geopark territory. Therefore, it is suggested that this model should be replicated to all schools in Cao Bang province. The presentation will focus on implementing of « Geopark Ambassador club » in schools of Non nuoc Cao Bang UNESCO global geopark. It also targets to the connection of geopark education to heritage preservation, social development and environment protection in Non nuoc Cao Bang UNESCO global geopark.

**Keywords:** Geopark education, sustainable development

**Corresponding author:** thuthuy91.cvdc@gmail.com

**Reference:**

Non nuoc Cao Bang UGGp's documents

## Over-tourism; Concentration of Tourists at Nabegataki Geosite, Aso UGGp and The Ethical Utilization for Natural Resources

*Koki NAGATA<sup>1\*</sup>, Hiroo MURAKAMI<sup>2</sup>, Koharu SOEJIMA<sup>1</sup>, Masahiro SASAHARA<sup>2</sup>,*

*Aso Geopark Promotion Council Office<sup>1</sup> Japan, Geopark Team, Town Information Division, Oguni Town Local government office<sup>2</sup> Japan, Aso Geopark Promotion Council Office<sup>1</sup> Japan, GeoparkTeam, Town Information Division, Oguni Town Local government office<sup>2</sup> Japan*

Oguni town is located in the northern part of the Aso UNESCO Global Geopark. It is characterized by its grassland culture created on a pyroclastic plateau about 90,000 years ago. It is also the birthplace of Kitasato Shibasabro, the founder of modern Japanese medicine. In recent years, Oguni town has taken the leading initiative in achieving SDGs and designated as Japan's SDGs Future City in 2018. Furthermore, they declared a Climate Emergency Declaration in 2020. Oguni Town has conveyed to people the scale of the massive pyroclastic flow and the aesthetic of the geomorphological feature created by the supervolcano through Nabegataki Geosite. The number of visitors has increased from almost none in 2013 to 245,603 in 2019. To handle this excessive increase in the number of visitors, they started charging fees or operating shuttle buses in 2015 to improve the environment. However, they could not solve the problem of traffic congestion in the neighborhood as well as the increased environmental burden. Therefore, they limited the number of visitors on holidays in 2020. In order to solve this over-tourism, they have introduced an Internet-based advance reservation system on a trial basis from November 3, 2021. They want to create a plenty space for visitors to interact with nature. Based on the results of this demonstration experiment, we would like to think about the ethical utilization of natural resources.

**Keywords:** Sustainable Tourism, SDGs12, Geo-tourism, Over-tourism

**Corresponding author:** info@aso-geopark.jp

**Reference:**

## Las Loras UGGp as a tool for an agro-ecological transition and support for local produce

*José Ángel SÁNCHEZ FABIÁN<sup>1\*</sup>, Karmah SALMAN MONTE<sup>1</sup>, Luis Javier MEDIAVILLA CALDERÓN<sup>2</sup>,  
Las Loras Global Unesco Geopark<sup>1</sup> Spain, Las Loras Global Unesco Geopark<sup>1</sup> Spain, ORGANICFARMER<sup>2</sup> Spain*

Agricultural production methods in Las Loras UNESCO Global Geopark have gravitated over the last few decades into intensive production models encouraged by European policies which have backed the industrialisation of agriculture and livestock farming and have favoured these types of practice which, in the long run, have demonstrated poor sustainability not only with regard to the environment, but also in that they have influenced negatively in the socioeconomic deterioration of the rural areas. With the aim of exploring new models of sustainable agricultural production, Las Loras Geopark is developing an integral project which on the one hand favours productive methods based on the principals of agro-ecology and on the other supports both local consumption and short marketing channels. This project began with a diagnostic study of the agro-livestock sector and the consumption and marketing models of local produce. This diagnosis is based on data published by Statistics National Institute and the Regional government and on 36 interviews with farmers and livestock farmers, 100 with consumers in the area and 23 with food product traders. Once the analysis of data obtained in the diagnostic phase was completed, different projects have been set up aimed at mitigating the weaknesses and threats detected in this study. A campaign has therefore been launched to publicise and disseminate local produce, in which the first 10 videos have been made involving local people (artisans, livestock farmers, farmers and small local shopkeepers) giving first-hand accounts of the socioeconomic and environmental importance and relevance of their activity. Furthermore, three local produce markets have been programmed in three different localities of the Geopark. Lastly, the five-year project "Test fields for potato varieties adapted to organic farming in Las Loras UNESCO Global Geopark" has been launched with a view to promote and improve the cultivation of seed potatoes in our territory.

**Keywords:** Sustainability, Agroecology, Local consumption, Organic farming, Test Field

**Corresponding author:** info.geoloras@gmail.com

**Reference:**

## New Activities For The Sustainable Development Of The Geopark Karawanken Crossborder Region

*Darja KOMAR<sup>1</sup>, Gerald HARTMANN<sup>1\*</sup>, Danijela MODREJ<sup>1</sup>, Antonia WEISSENBACHER<sup>1</sup>, Suzana FAJMUT-ŠTRUCL<sup>1</sup>, KARAWANKEN UNESCO GLOBAL GEOPARK<sup>1</sup> Austria, KARAWANKEN UNESCO GLOBAL GEOPARK<sup>1</sup> Slovenia*

Karawanken UNESCO Global Geopark, crossborder Geopark between Slovenia and Austria, comprises 14 municipalities, 9 on the Austrian side and 5 on the Slovenian side. One of its most important objectives is the general crossborder cooperation and development of the region in terms of sustainable regional policy. Therefore several international projects are currently ending in the Geopark. In the frame of two INTERREG SI-AT projects with the acronyms "NatureGame" and "NaKult", co-financed by the European Union, through the European Regional Development Fund, and Land Kärnten new geopark interpretational infrastructure was established. The crossborder region of the Geopark Karawanken is now reacher for several new information-interpretational points, infocentres, thematic paths, even adrenaline attractions for climbers and Olimpline - the longest uninterrupted zipline in Slovenia. Furthermore new main infocenter of the Karawanken UNESCO Global Geopark named GEO.DOM will open its door to public in spring 2022. Multifunctional building for knowledge transfer, information, entertainment and even gastronomy, will be located on Petzen mountain, heart of the Geopark Karawanken, near mountain station of the cable car, with the altitude of 1708 m. Additional activity for the sustainable development of the crossborder region was establishment of the EGTC - European Grouping for Territorial Cooperation. Since 27th of November 2019 EGTC Geopark Karawanken is the first EGTC on the Austrian-Slovenian border as well as the first EGTC with its official seat in Austria. New organization structure of the Geopark Karawanken has several advantages, for example, to facilitate cross-border cooperation and the potential for gaining strategic projects in the next EU programming period. At the same time cooperation in the Geopark Karawanken also in other areas (for example transport and mobility, protection against natural disasters) is expected.

**Keywords:** GEOPARK KARAWANKEN, NATUREGAME, NAKULT, INTERREG SI-AT, EGTC

**Corresponding author:** darja.komar@geopark.si

**Reference:**

## Developing Geopark Guide Training For Sustainable Tourism In Salpausselkä Geopark

*Vilma-Lotta TALLGREN<sup>1\*</sup>, Kati KOMULAINEN<sup>1</sup>, Maaria ALÉN<sup>2</sup>,*

*Salpausselkä Geopark<sup>1</sup> Finland, Salpausselkä Geopark<sup>1</sup> Finland, Salpaus Further Education<sup>2</sup> Finland*

Salpausselkä Aspiring UNESCO Global Geopark encompasses six municipalities in the region of Päijät-Häme, in southern Finland, only one hour by train from the capital city Helsinki. The geopark covers an area of 4,500 km<sup>2</sup> with some 178,000 inhabitants. The massive ice-marginal formations Salpausselkä I and II and their feeder eskers, surrounded by plentiful water bodies, form the backbone of the communities and the picturesque landscape, which offers great potential for geo-tourism. For several years, Salpaus Further Education (the region's largest vocational education and training institution) and LAB University of Applied Sciences (formerly Lahti UAS) have played a significant role in the cooperation network developing the aspiring geopark. Salpausselkä Geopark staff have offered short courses for the students and teachers, with themes including the UNESCO Global Geopark concept and the geological features of the area. Several students have participated in the geopark building process more deeply in form of internships and other hands-on learning possibilities, such as project courses. Furthermore, the local guides' associations and individual guides have taken part in the meetings of the tourism cooperation network of the geopark since early stages of the geopark project. Based on this previous development work and networking, a geopark guide training programme is being developed. The Salpausselkä Geopark staff organized a pilot course in May-June 2021 with authorized local guides as the main target group. There were 45 participants altogether, including students of Salpaus Further Education in the field of nature and environment studies and tourism professionals of the area, in addition to the main target group. The course programme consisted of a) a theory part introducing the geopark concept and the organization, geology, cultural heritage and geosites of Salpausselkä Geopark and b) field visits to some of the main geosites of the geopark. Inspired by the pilot course, the Salpaus Further Education Department of Tourism started to develop a formal training for geopark guides and entrepreneurs. This resulted in a new course 'Further vocational qualification in tourism industry', which will start during the first half of 2022. The training includes education about general tourism knowledge, sustainability in tourism, themes and trends in tourism (such as food tourism and educational tourism), wild food services, nature-based experiences, as well as the concept and story, the geological features and main sites of Salpausselkä Geopark. Having geopark themes integrated into formal vocational education is an important step in the development of sustainable tourism in the area.

**Keywords:** Sustainable Tourism, Geopark, Vocational Training, Education, Finland

**Corresponding author:** vilma-lotta.tallgren@lahtiregion.fi

**Reference:**

<https://visitlahti.fi/en/frontpage/salpausselka-geopark/> <https://en.salpaus.fi/>

## Sustainable Tourism : Positioning And Developing A Green Identity

*Alain PETIT<sup>1</sup>\*,  
Famenne-Ardenne UGGp<sup>1</sup> Belgium*

The « Green Tourism » project is the result of joint work and collaboration between the Tourist Office and the Famenne-Ardenne UGGp. Through the European funds Feader Leader II, the Tourist Office benefits from an envelope of 60.000 euros. The main objective of the project is to position and promote the territory by associating it with a green identity (enhancement and discovery of nature) and sustainable (respect for the environment) of reference. Within the framework of this form, the sensitization to the respect of our environment and to the eco-responsible practices is addressed, on the one hand, to our tourist operators, all sectors included, and on the other hand, to the visitors. The first phase was to conduct a survey of tourist operators. The objectives of the survey were to : - to know the good environmental practices already in place in the tourism sector of the Famenne-Ardenne area ; - to identify the expectations of our operators in terms of good practices ; - to be able, through the results obtained, to increase awareness of the importance of green tourism among operators and visitors ; - to develop supports for our operators and visitors. The survey is composed of 9 main categories : energy, water, waste treatment, means of transport, communication, local consumption, tourism offer, labels, support and training. The survey results underline the interest of our operators in the file since we can note a very good rate of answers. The vast majority of operators are already sensitive to the issue of energy conservation within their structure. Whether it is in terms of water (rainwater recovery), electricity (promoting LED lighting, automatic switches, etc.). The notion of short circuit and local economic development has become essential in the entire tourism sector. As a follow-up to the results of the survey, the Tourist Office and the Geopark have worked on a Vade-mecum of "good practices" for our tourist operators. This Vade-Mecum covers the main themes and gives advice on Green Tourism that respects the environment. If the operator is an important player, so is the tourist. A folder has therefore been published for visitors, inviting them to adopt good environmental practices. This folder is widely distributed in the reception offices but also during external actions such as fairs and exhibitions. A placemat was also produced for distribution in the catering sector. The next step is training that will be organised with testimonies of operators who adopt excellent environmental practices but also experts who will give sound advice on energy consumption, short circuits, waste treatment, etc. We are also currently working on the creation of films featuring various environmentally friendly behaviours.

**Keywords:** Famenne-Ardenne, Green Tourism, Sustainable Tourism

**Corresponding author:** [alain.petit@geoparkfamenneardenne.be](mailto:alain.petit@geoparkfamenneardenne.be)

**Reference:**

Green Tourism - European funds Leader II

## RURITAGE project – uniting geoparks around rural regeneration

*Irina PAVLOVA<sup>1\*</sup>, Claudia DE LUCA<sup>2</sup>, Charalampos FASSOULAS<sup>3</sup>, Sara GENTILINI<sup>4</sup>, Nickolas ZOUROS<sup>5</sup>,*

*UNESCO<sup>1</sup> France, University of Bologna<sup>2</sup> Italy, Psiloritis UGGp, Natural History Museum of Crete, University of Crete<sup>3</sup> Greece, Magma UNESCO Global Geopark<sup>4</sup> Norway, Natural History Museum of the Lesvos Petrified Forest, Lesvos Island UNESCO Global Geopark<sup>5</sup> Greece*

In June 2018, several European UNESCO Global Geoparks (UGGps) together with UNESCO's Section on Earth Sciences and Geohazard Risk Reduction joined a four-year-long EU-Horizon2020 funded research project – "Rural regeneration through systemic heritage-led strategies" (RURITAGE). The aim is to enable rural regeneration through heritage. The intention is to regenerate rural areas with the help of the Systemic Innovation Areas (SIA) framework which identifies unique heritage potential within rural communities: Pilgrimage, Resilience, Sustainable Local Food Production, Integrated Landscape Management, Migration and Art and Festivals. Throughout the RURITAGE project, thirteen rural areas have been selected as Role Models (RMs). The RMs are recognised as prosperous cases that have regenerated with the help of cultural and natural heritage. RMs have been selected in reference to the six different SIAs. Prosperous practices of the RMs are analysed and furthermore transferred to six selected Replicators (Rs), one per SIA. These Rs represent local communities within rural territories that are in the process of building their own heritage-led regeneration strategies, although in need of support to improve their skills, knowledge and capacity building. Three UGGPs joined RURITAGE as RMs. Lesvos UNESCO Global Geopark (Greece), being a RM for Migration SIA, boosts migrant integration with nature in Lesvos Island. Two UNESCO Global Geoparks – Psiloritis (Greece) and Katla (Iceland), have been inspiring others as the Resilience SIA RMs in their resilience culture and awareness activities. Another three UNESCO Global Geoparks are RURITAGE Rs. R for local food SIA - Magma UGGp (Norway) - is strengthening its brand for discovering local food products and traditions. Bergstrasse-Odenwald UGGp (Germany) is R for Migration SIA and is exploring ways how heritage can contribute to migrants' integration. Karavanke UGGp (Austria/Slovenia) selected to join as the R on Pilgrimage SIA and is putting forward territories' old traditions and modern world along the pilgrimage route to Hemmaberg. Moreover, several territories – including Styrian Eisenwurzen UGGp (Austria) - joined RURITAGE as Additional Replicators. Additional Rs have the opportunity to learn from the RURITAGE RMs, Rs and knowledge experts and to access a wide range of tools and knowledge to develop their own heritage-led regeneration plans. RURITAGE was among the first H2020's experiences for involved UGGPs. The overall impression is very positive. RURITAGE participative methodologies and tools are considered beneficial for the development of involved UGGPs. Moreover, this H2020 project brought additional finances and activities, that come together with more visibility and recognition of the territory. RURITAGE enlarged networking moments and brought "fresh air" and new ideas. Involved UGGPs agree that methodologies could be uptake by both already established UGGPs and Aspiring Geoparks in other regions.

**Keywords:** rural regeneration, enhancement plans, rural heritage hub, cooperation

**Corresponding author:** [i.pavlova@unesco.org](mailto:i.pavlova@unesco.org)

**Reference:**

<https://www.ruritage.eu/>

## Applications of geographical information system - Databases to the holistic management of Orígens and Courel Mountains UNESCO Global Geoparks, Spain

*Daniel BALLESTEROS<sup>1\*</sup>, Xavi MIR<sup>2</sup>, Guillem PURAS<sup>2</sup>, Nuria VERDENY<sup>2</sup>, Martín ALEMPARTE<sup>1</sup>,*

*Courel Mountains UGGp<sup>1</sup> Spain, Orígens UGGp<sup>2</sup> Spain, Orígens UGGp<sup>2</sup> Spain, Orígens UGGp<sup>2</sup> Spain, Courel Mountains UGGp<sup>1</sup> Spain*

The governance of a UNESCO Global Geopark (UGGp) requires a vast wealth of miscellaneous information that can be successfully organized in a spatial database using a geographical information system (GIS). This work shows the designs and applications of two GIS-databases to the management of two young Spanish UGGp named Orígens (stated in 2018) and Courel Mountains (founded in 2019). Both databases were developed by multidisciplinary teams (including scientists, managers and local agents) and were compiled from public sources and previous work, or produced through mapping and GIS-tools. The Orígens UGGp GIS-database comprises 48 coverages including cartographical, geological, natural and cultural heritage and tourism data. In Courel Mountains, its database is structured in 66 coverages containing technical, geoscience, biodiversity and cultural information. Both GIS-databases allow us to design a broad range of thematic maps mainly for tourism and education actions, showing specific subjects and the interacting relationships between Earth processes, biodiversity and human history. Besides, the databases are used for planning and design of UGGp facilities, providing also assistance for research and geoconservation actions. Web Map Services available from other institutions, such the National Geographical Institute, are also used as background information. In conclusion, GIS reveals itself as a useful tool for the management of UGGp, providing a comprehensive overview of the territories and supplying technical and scientific assistance based on homogeneous, revised, and structured knowledge.

**Keywords:** database, geographical information system, management, UNESCO Global Geopark

**Corresponding author:** dballesteros@ugr.es

**Reference:**

## UNESCO Global Geoparks, territories of inclusion and sustainability - Information panels in the aspiring Geopark Oeste

*Miguel REIS SILVA<sup>1\*</sup>, Nuno PIMENTEL<sup>2</sup>, Bruno PEREIRA<sup>1</sup>, Rita PEREIRA<sup>1</sup>, Inês LUCAS<sup>1</sup>,*

*Aspiring Geopark Oeste<sup>1</sup> Portugal, Aspiring Geopark Oeste | Universidade de Lisboa<sup>2</sup> Portugal, Aspiring Geopark Oeste<sup>1</sup> Portugal,  
Aspiring Geopark Oeste<sup>1</sup> Portugal, Aspiring Geopark Oeste<sup>1</sup> Portugal*

The Oeste aspiring Geopark (OaG) comprises six municipalities, in Portugal's central region (Europe), encompassing an area of 1,154 km<sup>2</sup> and 72 km of coastline. Located north of the capital, Lisbon, the Jurassic period and its dinosaurs are its geological highlight. With about 80 geosites (some public, others not), our mission is to provide easily accessible, simple, and concise information about its important heritage to a variety of audiences. With this goal, the OaG designed a set of interpretative panels with the following premises: i) resistance to aggressive weather conditions and possible acts of vandalism; ii) outfit and content appealing to all visitors; iii) arising curiosity and serving as a gateway to obtain more information; and iv) all information accessible to all citizens, even for those with disabilities. At the structural level, both the inclination and the height of the interpretative panels were designed specially thinking on toddlers and to easily fit wheelchairs. Descriptive texts were created to be appealing to all ages and concise. They describe the most relevant information about the heritage present at that site, both natural and cultural. Several images and photographs are also present, representing elements mentioned in the text and aiding the explanation of geological processes. Further written and visual materials can be accessed via a QR CODE, such as, more written information about the present heritage and related images and videos, directed to different age groups. The feature that stands out in these panels is a three-dimensional model of the geosite geomorphology and its surrounding area. With about one third of the panel's area, visitors with visual impairment can have a tactile perception of the surrounding landscape. Citizens without visual limitations find it also visually stimulating and are invited to have the same tactile experience. Next to the QR CODE, there will be a text in Braille, inviting citizens with visual impairment to access the information on the panel and other complementary materials, via their cell phone. These visitors frequently use an application on their mobile devices that serves as an audio guide, reading written information displayed on webpages. We believe that implementing such a project decisively contributes to a global and inclusive access to information and science, stressing the "inclusive" status of the interpretative panels.

**Keywords:** sustainability, information, panels, inclusion, visual impairment

**Corresponding author:** miguel.silva@geoparqueoeste.com

**Reference:**

## UNESCO Global Geoparks and the 2030 Agenda for Sustainable Development - The Perfect Marriage for a Better World

*Elizabeth SILVA<sup>1\*</sup>, Artur SÁ<sup>2</sup>,*

*Geosciences Center of Coimbra University, Portugal<sup>1</sup> Portugal, University of Trás-os-Montese Alto Douro(UTAD), Portugal; Geosciences Center of Coimbra University, Portugal<sup>2</sup> Portugal*

Since the creation of the concept of Geoparks, and later on, with the approval in 2015 of the new designation of the UNESCO Global Geoparks (UGGps), sustainable development has been considered one of the main pillars of these territories. However, how to quantify the real contribution of the UGGps to the achievement of the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda? With the aim to reply to this question, a research study was done and concluded in 2021, using different data sources. Through the analysis of different data, such as Progress Reports, questionnaires done to the managers, interviews done to the staff members and inhabitants of the transnational Marble Arch Caves UGGp, and also the contents of the abstracts of two International Conferences on Geoparks, it was possible to reach feasible and solid results, based on more than 5000 collected data regarding the selected UGGps. This research allowed to conclude that UGGps contribute to the achievement of the 17 SDGs, directly or indirectly. With this research it was also possible to present a working tool to assist the managers to do the immediate correlation between the developed activities and the SDGs. The data analysis also allowed to highlight best practices, considering the developed activities by the selected UGGps. Finally, with this scientific research, based on a mixed methodology (quantitative and qualitative approach), it was possible to understand that the UGGps contribute far more than the eight SDGs initially selected by the International Geoscience and Geoparks Programme (IGGP) of UNESCO, and also to many other targets besides those highlighted by the IGGP. In this context, and as referred in the preamble of the United Nations resolution that established the 2030 Agenda for Sustainable Development (A/RES/70/1), the UGGps activities do the perfect marriage between the goals and targets in areas of critical importance for Humanity and the Planet.

**Keywords:** UNESCO Global Geoparks (UGGps), International Geoscience and Geoparks Programme (IGGP), Sustainable Development, SDGs, Research Study

**Corresponding author:** elizabethsilva.m@gmail.com

**Reference:**

SILVA, ELIZABETH MARIA ROCHA DA (2021). The contribution of the European UNESCO Global Geoparks for the 2030 Agenda for Sustainable Development – a study based on several data sources [Unpublished doctoral dissertation]. Universidade Nova de Lisboa. <http://hdl.handle.net/10362/114994> UNITED NATIONS (2015). Resolution adopted by the General Assembly on 25 September 2015. [https://www.un.org/ga/search/view\\_doc.asp?symbol=A/RES/70/1&Lang=E](https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E)

## M'Goun UNESCO Global Geopark As A Vector Of Geo-Tourism And Socio-Economic Development

*Driss ACHBAL<sup>1\*</sup>,  
UGGP of M'goun<sup>1</sup> Morocco*

The M'Goun Geopark covers a mid-to-high-mountain region with mainly geological formations belonging to the Triassic, Jurassic and Cretaceous systems. It is a coherent whole with much accentuated reliefs from 1,000 to 4,000 m of altitude with a morphology and landscapes and contrasts of colors spectacular. The geological history of the Geopark M'Goun is part of the geological evolution of the High Central Atlas dating back to the Triassic era, 250 million years ago, the sedimentary filling of Atlasic grooves took place during the Jurassic-Cretaceous, the uplift of the atlasean chain is mainly related to the paroxysmal phases of the Miocene due to the Africa-Europe rapprochement (alpine orogenesis). The total population of the Geopark is about 218,000. It is mostly rural and Amazighophone. The populations of the High Atlas of Azilal are linked to a peasant and pastoral mountain lifestyle, showing ancestral Amazigh traditions that manifest themselves during their many ceremonies with songs and dances. These cultural components are part of a well-defined natural and social environment and reflect the mutual exchange between man and his environment. The UNESCO Geopark of M'Goun is the first geopark in Morocco, Africa and the Arab world, is located in the middle of the chain of the central high atlas between Beni Mellal city in the north and the ridge line of the Ighil M'Goun to the south. The M'Goun Geopark is a protected territory which includes not only a certain number of geosites with exceptional interest, but also many places of ecological, archaeological, historical and cultural values. Indeed, The Geopark M'Goun encompasses 15 towns, and more than 22 geosites. Moreover, the territory of the Geopark contains 6 Sites of Biological and Ecological Interest (SBEI). The Geopark M'Goun covers an estimated area of over 5,700 km<sup>2</sup>. It is geographically located at 100 km from Marrakech city, 330 km from Casablanca city, 371 km from Fes city, and 298 km from rabat city. It's represent an important actor for the socio-economic development of the region. it stimulates the development of tourism, in particular geotourism and ecological tourism, which generates the creation of local businesses, thus producing new sources of income for the population. The UNESCO Geopark of M'Goun has also an educational vocation. It aims to offer a scientific and environmental educational program. The association of Geopark M'Goun was created in 2005, and in 2014 the Geopark has accepted to join the Global Geoparks Network (GGN) supported by UNESCO (6th International Conference). The creation of Geopark M'Goun, in collaboration with all the partners concerned, aims to make this territory a model of development and thus initiate a change in behavior towards responsible tourism that contributes, to the development of the region by respecting the natural, cultural and landscape heritage.

**Keywords:** M'Goun Geopark, Geology, socioeconomic development, culture, heritage, beni mellal khenifra, Morocco

**Corresponding author:** dgs.rbk@gmail.com

**Reference:**

- Local studies in the geopark m'goun territory - University studies and project of master and licence - Phd studies

## Joining Local-To-Global Initiatives, and Guiding the Geopark Through UN SDGs

*Leah BENETTI<sup>1</sup>, Beth PETERKIN<sup>1\*</sup>,*

*Cliffs of Fundy UNESCO Global Geopark<sup>1</sup> Canada, Cliffs of Fundy UNESCO Global Geopark<sup>1</sup> Canada*

No organization can effect positive global change on their own. It requires the alignment and interconnection of local values with global movements. From their initial year as a UNESCO Global Geopark, The Cliffs of Fundy Geopark in Nova Scotia has committed to sustainable tourism and sustainable local development in our region. A number of local-to-global initiatives have been joined including; BioBlitz, a one-day citizen science event with the iNaturalist App. BioBlitzes allow georeferenced environmental data to be collected and later be contextualized within broader scientific research. The Great Canadian Shoreline Cleanup, the largest clean-up organization in Canada which also requires the reporting of litter collected to larger data sets. We coincided our event with World Cleanup Day. GEOfood, a brand originating in MAGMA geopark in Norway which promotes environmentally friendly food enterprises located within UNESCO Global Geoparks around the World. This led to our "Fundy Food Trail" event – a self-guided culinary tour through our region. These activities target SDGs #12 Responsible Consumption and Production, #13 Climate Action, #14 Life Below Water and #15 Life on Land. In addition to these clear examples, the Cliffs of Fundy has developed a guiding document where all possible Geopark activities are tied back to the 17 Sustainable Development Goals. As a result of the connections back to global initiatives, these local actions have been picked up and featured in local and global media outlets, subsequently growing the support, promotion, and participation for this form of geotourism.

**Keywords:** Cliffs of Fundy, Nova Scotia, Geotourism, local-to-global movements, Sustainable Development Goals

**Corresponding author:** leah.benetti@fundygeopark.ca

**Reference:**

Benetti, L. R. and Beth Peterkin (2021). Joining Local-To-Global Initiatives and Guiding the Geopark Through UN SDGs. Abstract, Jeju 2020 International Conference on UNESCO Global Geoparks.

## A Case Study Of Housing Affordability And Vacation Rental Regulations In Niagara Falls, Canada

*Hannah WILLMS<sup>1\*</sup>,  
Brock University<sup>1</sup> Canada*

Tourism plays a central role in global geoparks. This research focuses on housing in the context of growing unaffordability and increasing popularity of short-term vacation rentals (like Airbnb) in Niagara Falls, Ontario. In a city like Niagara Falls, which sees 12 million tourists annually, vacation rentals have become a highly profitable venture. However, Niagara is also currently experiencing a housing crisis. Airbnb complicates this crisis by perpetuating discourses in which housing is viewed primarily as a commodity. Commodification of housing, through processes of neoliberalization, financialization and securitization, results in inflated housing prices. More importantly, many people have accepted the unaffordability of housing because of discourses related to homeownership, mortgage debt, and asset-based welfare. These discourses normalize the commodification of housing, making processes like privatization, gentrification and Airbnb conversions seem natural. Housing practices based on these discourses disproportionately affect the underhoused. My research questions include: 'how does the hegemony of homeownership affect the housing markets in Niagara Falls?'; 'what elements of the homeownership discourse are used to describe both long-term rentals and vacation rentals in Niagara Falls?'; and, 'what are the consequences of these discourses for housing affordability in Niagara Falls?' To answer these questions, I conducted a content and discourse analysis of city documents and city council meeting transcripts. My intent is to explain how respondents conceptualize their experiences related to vacation rental regulations in the context of housing discourses. Furthermore, I shall be analyzing the prominent discourses to examine the relationship between Airbnb and housing affordability in Niagara Falls, Ontario. My findings show that multifaceted homeownership discourses guided the discussions. All of these tend to stigmatize rentals in general, and long-term renters in particular. I conclude that the current housing system privileges homeownership at the expense of the renter population. This, in turn, has made homeowners' expectations the fixation of Airbnb debates with little concern for how it affects housing affordability.

**Keywords:** housing affordability, commodification, tourism, Airbnb, Niagara Falls

**Corresponding author:** ha13te@brocku.ca

**Reference:**

Aalbers, M. B. (2008). The financialization of home and the mortgage market crisis. *Competition and Change*, 12(2), 148–166.  
Cardoso, T. & Lundy, M. (2019, June 20). Airbnb likely kept 31,000 homes out of long-term rental market: study. *The Globe and Mail*.  
Doling, J. & Ronald, R. (2010). Home ownership and asset-based welfare. *Journal of Housing and the Built Environment*, 25(2), 165-173.  
Dubinsky, Z. & Ouellet, V. (2019, April 30). Who's behind the smiling faces of some Airbnb hosts? Multimillion-dollar corporations. *CBC News*.  
O'Mahoney, L. F. & Overton, L. (2015). Asset-based welfare, equity release and the meaning of the owned home. *Housing Studies*, 30(3), 392-412.  
Walks, A. (2013). Mapping the urban debtscape: the geography of household debt in Canadian cities. *Urban Geography*, 34(2), 153-187.  
Walks, A. & Clifford, B. (2015). The political economy of mortgage securitization and the neoliberalization of housing policy in Canada. *Environment and Planning A*, 47(1), 1624-1642.

## Rural Tourism Fostered in Yandangshan UNESCO Global Geopark

Qinfei LU<sup>1\*</sup>,

*Yandangshan UGGp Management Committee<sup>1</sup> China*

2021 is the Year of 'Beautiful China – Regional Tourism'. Yandangshan becomes the centre and foundation of regional tourism development in the region from which stimulant radiates to the adjacent villages and towns and eventually covers the whole area surrounding the geopark. Yandangshan has adopted the new concept of 'Geotourism and Healthy Life' for fostering sustainable development through three separate strategic arms of 'Geotourism and Leisure', 'Geotourism and Health' and 'Geopark and Dendrobium Farm Enterprise'. The geopark continues to promote itself as an excellent geotourism venue for leisure and education but has added extra health elements to provide visitors with healthy travel experiences. Activities such as guided visits to dendrobium farms, exhibition centres and processing factories as well as providing hand-picking, family farm-stay, spa healing experiences. These activities are taken place in 15 different villages with the direct involvement of 20,000 local people. The geopark authority works with well-managed dendrobium farms and associated outfits, allowing them the use of geopark logo for their products such as dendrobium powder, capsules, beer and face masks. In 2020, the total dendrobium growing area in Yandangshan has increased to 22,000 acres and has brought about 3.6 billion yuan (USD 58 million) of revenue and created 70,000 direct and indirect jobs to the local community.

**Keywords:** rural tourism, geotourism, dendrobium, local community, jobs

**Corresponding author:** 361059978@qq.com

**Reference:**

Yandangshan UGGp Geotourism Development Relative Information.

## The Discussion on Geotourism Development of Xiangxi Global Geopark Under the Influence of Pandemic

Qingzi YE<sup>1\*</sup>,

*Geoparks Administration of Xiangxi Autonomous Prefecture<sup>1</sup> China*

Xiangxi Global Geopark, which is surrounded by many well-known tourist attractions at home and abroad, including Dehang Grand Canyon, Red Stone Forest, Shibadong Miao Ethnic Village, Fenghuang Ancient Town and Laosicheng, consists of 7 parks and also boasts precious geosites, biological diversity and rich cultural scenery. During the pandemic period, the local authority improved the mechanism of pandemic prevention and utilized resources sufficiently, as well as building a geotourism brand, and by means of enhancing promotion and marketing, cooperating with partners and developing new products for tourists, the geotourism industry in Xiangxi Global Geopark flourished with 25.5 billion yuan tourism revenue and 4.5 million tourists in 2020, while income of indigenous people rose steadily. Based on examples and data, the study discusses the measures carried out by the administration of the global geopark to promote the geotourism development and increase local residents' earning under the influence of the pandemic.

**Keywords:** Xiangxi Global Geopark, geotourism, sustainable development, pandemic

**Corresponding author:** xxzsjdzgy@163.com

**Reference:**

## A Truly Madly Deeply Love in Batur: Implementation of Environmental Service Payment for Geoheritage and Community Welfare

*Eli Jamilah MIHARDJA<sup>1</sup>, Sofia W. ALISJAHBANA<sup>1</sup>, Prima Mulyasari AGUSTINI<sup>1</sup>, Togu S. PARDEDE<sup>2\*</sup>,  
Universitas Bakrie<sup>1</sup> Indonesia, Universitas Bakrie<sup>1</sup> Indonesia, Universitas Bakrie<sup>1</sup> Indonesia, Bappenas<sup>2</sup> Indonesia*

Loving the Earth and its legacy is a must. Earth is a form of truly madly deeply love for humans. A love that will last as long as it exists. A love that all its inhabitants must maintain so that it will still exist. In Batur, love is in the form of an invaluable and irreplaceable geoheritage. Various efforts were taken to maintain it as well as an effort for the community to survive. For the purpose of preserving love as well, an environmental service payment mechanism. This article describes the implementation of environmental service payments from the tourism industry in Batur UGGp for forest and water conservation and the future of human life. The discussion uses Social Capital theory (Bourdieu, 1986) to explain the results of the assessment of ecosystem services carried out. Social capital in the form of ecosystem service implementation will be an effort to maintain Earth's heritage. And Mother Earth, like Savage Garden's lyrics, can be whatever that we want: 'dream, wish, fantasy, hope, love, and everything that you need'.

**Keywords:** social capital, forest and water conservation, environmental service payment, geoheritage, sustainable local development

**Corresponding author:** eli.mihardja@bakrie.ac.id

**Reference:**

Sagala, S., Rosyidie, A., Sasongko, M. A., & Syahbid, M. M. (2018, May). Who gets the benefits of geopark establishment? A study of Batur Geopark Area, Bali Province, Indonesia. In IOP Conference Series: Earth and Environmental Science (Vol. 158, No. 1, p. 012034). IOP Publishing. Rosyidie, A., Sagala, S., Syahbid, M. M., & Sasongko, M. A. (2018, May). The Current Observation and Challenges of Tourism Development in Batur Global Geopark Area, Bali Province, Indonesia. In IOP Conference Series: Earth and Environmental Science (Vol. 158, No. 1, p. 012033). IOP Publishing. Yuliawati, A. K., Pribadi, K. N., & Hadian, M. S. D. (2016). Geotourism resources as part of sustainable development in Geopark Indonesia. *Journal of Business and Management Research*, 15. Suwintari, I. G. A. E., & Dewi, I. G. A. M. (2019). SWOT Analysis of the Development Event Promotion at Pavilion Batur, Geopark, Bangli Regency, Bali. *GARUDA (Global Research on Tourism Development and Advancement)*, 2(1), 20-26. Zhang, B., Li, W. H., Xie, G. D., & Xiao, Y. (2009). Water conservation function and its measurement methods of forest ecosystem. *Chinese Journal of Ecology*, 28(3), 529-534. Peterson, J. M., Smith, C. M., Leatherman, J. C., Hendricks, N. P., & Fox, J. A. (2015). Transaction costs in payment for environmental service contracts. *American Journal of Agricultural Economics*, 97(1), 219-238. Yustiana, Y. O. O. C. E., Hernawan, E. N. D. A. N. G., & Ramdan, H. I. K. M. A. T. (2015). Penentuan model tarif sumber daya air sebagai kompensasi jasa ekosistem kawasan hutan. In *Prosiding Seminar Nasional (Vol. 1, pp. 1735-1740)*.

## Collaboration of Tourism and Geopark – Geopark Visitor Center, Accommodation, Tourist Information and Local Guides

*Sawako ISHIHARA<sup>1\*</sup>,*

*Oki Islands UGGp Promotion Committee<sup>1</sup> Japan*

A new geopark based facility was opened on the Oki Islands, which have 4 inhabited islands and over 180 uninhabited islands. It is named Entô and it has two functions, as an accommodation and as a base facility of the Oki Islands UNESCO Global Geopark. Together with the renovation of one and only hotel on Nakanoshima Island, one of the 4 inhabited islands, the town government decided to include a geopark facility to welcome visitors from all over the world and introduce the true value of the islands. Facilities are 1) A door leading to the Geopark. In just one facility, Entô, not only will visitors find hotel facilities such as guest rooms and hot spring baths, they will also find amenities in the room that draw out the wonders and allure of the geopark experience. Take a stroll around the hotel and people will come across discoveries they would not expect to find in a hotel. All of what people will find within Entô is connected to the vast beauty of the Geopark that sits just outside. 2) Learn before you encounter the real thing. Entô, being a hub of the Geopark, also has an exhibition room called the Geo Room “Discover” where people can learn about the history of the Oki Islands, the 3 islands of Dōzen, and their long, pure relationship with Mother Earth. It is packed with fascinating information and knowledge that will help people understand and further enjoy the Geopark. Once people have gained some knowledge, head out into the real thing and experience everything fully - the colors, the sounds, and the smells. We hope people immerse themselves fully into a scenery that may only exist today, within nature that people can find only here. 3) A place that connects to a time billions of years ago. On the first floor of the annex building (Entô NEST), people will find a space where one wall is a massive window that shows a gorgeous view of the geopark landscape. Fossils of dinosaurs and creatures of ancient times are displayed in the same space. Take a seat on a sofa and spend some quiet time pondering the scale of Earth’s evolution. The facility is managed through co-operation between variety of players in the islands, Geopark Promotion Committee, guide group, hotel staff, students, and local volunteers, welcoming visitors from all over the world and connecting them to local history, culture, lifestyle, and nature. It has just started to operate with 2 main functions, and it is trying to be a hub between visitors and locals.

**Keywords:** visitor center, island, hotel, geotourism, guide

**Corresponding author:** ishihara@oki-geopark.jp

**Reference:**

## Geosite Conservation Within Development Area: Case Study in Lembah Kinta National Geopark, Malaysia

*Rapidah MAT STAFA<sup>1\*</sup>, Ibrahim KOMOO<sup>1</sup>, Norhayati AHMAD<sup>1</sup>, Che Aziz ALI<sup>1</sup>, Abd Rasid JAAPAR<sup>1</sup>,*

*Geopark Geotourism Creative Solutions<sup>1</sup> Malaysia, Geopark Geotourism Creative Solutions<sup>1</sup> Malaysia*

Limestone hills are areas of active geomorphological processes, important and singular examples of geodiversity. Because of their unique natural archives, they require holistic and integrated management. Limestone karst hills are limited in Malaysia but are widely scattered in the Kinta Valley. One of the specialities of Kinta Valley Geopark is the beauty and scientific value of the tropical karst hills. The limestone hills of the Kinta Valley represent tropical karst area of outstanding value, and it has been the basis of the National Geopark establishment. However, the development of tropical karst in the Kinta Valley can be divided into three categories: a) conservation areas, b) active quarry or mine areas, and c) former quarry or mine areas. The primary responsibility upon the active quarry areas is to manage quarry activities sustainably and at the same time conserve sites of high heritage value within the quarry concession. An assessment of the importance of heritage status can be used to determine the boundary of geosite and subsequently implement management actions to conserve and support the vision of Kinta Valley National Geopark. Based on this study, the conservation of a geosite with special features, such as cave area and a doline lake must be given higher priority, especially in the perspective of landform integrity and public safety if opened for recreational activities. A plan for the development of geosite and rehabilitation of the quarry after the quarrying operation requires closer attention and should be preserved at its original location for the benefit of the development of Kinta Valley National Geopark as a national treasure for the future generation.

**Keywords:** karst, limestone, geopark, geoheritage, sustainability

**Corresponding author:** rapidahms@gmail.com

**Reference:**

Gray, M. 2004. Geodiversity: valuing and conserving abiotic nature. John Wiley & Sons, London, 434pp.

## Empirical Operation of Satun UNESCO Global Geopark of Thailand according to Sustainable Development Goals

*Fa-is JINDEWHA<sup>1\*</sup>, Narongrit THUNGPRUE<sup>1</sup>,*

*Satun UNESCO Global Geopark<sup>1</sup> Thailand, Satun UNESCO Global Geopark<sup>1</sup> Thailand*

Although Satun Thailand Geopark was certified as a member of UNESCO Global Geopark (UGGp) in 2018, we continue to improve in every criterion for UGGp: Geological heritage sites and conservation, Education for local citizens, and Local economic development. These also follow the Sustainable Development Goals (SDGs 17) that are the goals of today's world. This report aims to present two recent research studies which reflect the empirical operation of Satun Global Geopark administration contributing to SDGs 17 in Goal 1, 4, and 8. The first is technical research named Geophysical investigation of the karst geosites in Satun UNESCO Global Geopark, Thailand: implication for sinkhole hazard assessment. This study uses geophysical instruments to assess the risk of sinkhole hazards in karst-related areas. Its result can lead to disaster preparedness which contributes to Goal 1, especially target 1.5. The second is the academic report of the Department of Mineral Resources, Thailand. It is present the Tham Le Stegodon or Le cave case study as the new geotourism route in Satun using Dowling's geotourism concept to analyze with UGGp self-Evaluation checklist for aspiring UNESCO Global Geoparks. The result shows four geoheritage development into geotourism attraction guidelines: knowledge development for tourism, public utilities, and transportation system, local networking, and business opportunities. This case study can be a model for designing new tourism routes that link geological, ecological, and cultural stories. This work contributes to Goal 4 in lifelong learning opportunities, global citizen consciousness, and Goal 8 in geotourism to local sustainability. In conclusion, Satun UNESCO Global Geopark is contributing to UNESCO's criteria and SDGs 17. It is not only Goal 1, 4, and 8 that can be seen as tangible, but we are also working the most on every goal.

**Keywords:** Satun Province, Sustainable Development Goals, Geophysical instruments, Sinkhole hazard, Geotourism route

**Corresponding author:** satungeopark@gmail.com

**Reference:**

References Department of Mineral Resources, 2020. Guidelines for developing geoheritage sites into geotourism attractions for Sustainable Development: The Case Study of the Tham Le Stegodon Geotourism Route. [online] Surat Thani, Thailand: Department of Mineral Resources. Available at: [Accessed 3 November 2021]. Geopark-vulkaneifel.de. n.d. UNESCO Global Geoparks contributing to the Sustainable Development Goals. [online] Available at: [Accessed 3 November 2021]. n.d. UNESCO GLOBAL GEOPARKS Celebrating Earth Heritage, Sustaining Local Communities. [online] Available at: [Accessed 7 November 2021]. UNESCO. 2021. Fundamental Areas - Main Focus Areas - Sustainable Development Goals. [online] Available at: [Accessed 3 November 2021]. Yordkayhun, S., Wattanasen, K. and Thungprue, N., 2021. Geophysical investigation of the karst geosites in Satun UNESCO Global Geopark, Thailand: implication for sinkhole hazard assessment. *Geosciences Journal*,.

## Geotourism for community engagement for inclusive and equitable development

*Thùy VI TRAN<sup>1\*</sup>,*

*Non nuoc Cao Bang geopark<sup>1</sup> Vietnam*

Non nuoc Cao Bang, a remote frontier area located in the North of Vietnam, was designated as a UNESCO global geopark in 2018. This designation has been assisting Cao Bang province moving towards an inclusive, equitable and conservation-based socio-economic development. The criteria of a UNESCO global geopark in the operational guideline has 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 Vietnam, its history has been associated with the development and independence struggle for independence of Vietnam. 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. Unequitable 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.

**Keywords:** equitable, geotourism, inclusive, community engagement, equitable

**Corresponding author:** vitranthuy@gmail.com

**Reference:**

Reports of Department of Cultures Sports and Tourism

## Integration of Culture and Tourism, Innovative Development - The "Tourism+" Effect of Yuntaishan UNESCO Global Geopark

Yutong ZHU<sup>1\*</sup>, Xiaopeng SANG<sup>2</sup>, Yibin YUAN<sup>2</sup>,

Geopark Team, Yuntaishan UGGp Management Committee, Jiaozuo city, Henan Province, China<sup>1</sup> China, Geopark Team, Forestry Bureau of Jiaozuo City, Henan Province, China<sup>2</sup> China, Geopark Team, Forestry Bureau of Jiaozuo City, Henan Province, China<sup>2</sup> China

Yuntaishan UNESCO Global Geopark is a comprehensive park featured by rift tectonic structure, hydrodynamic action and geological landscape, also, this geopark has natural ecology, human landscape and scientific and aesthetic values as a whole. The main geological heritages of The Geopark include stratigraphic section, rock geoheritage, structural geoheritage, paleontological geoheritage, geological landscape, hydrogeological heritage, geological hazard heritage and other types. Since the establishment of Yuntaishan UNESCO Global Geopark, the Geopark actively promotes all-round and effective participation of local communities and indigenous people. We have always adhered to our social responsibility to benefit the people. The Geopark has invested 135 shops in each scenic area and operated them for free. The Geopark has not only created employment opportunities for residents, but also explored the model of "tourism plus Finance plus accommodation plus poverty alleviation", which can directly benefit the villagers through tourism. The Geopark has created a series of special tourism products including recreation and vacation, parent-child leisure, entertainment experience and so on. It also focuses on the integration of culture and tourism, innovative development, development of cultural and creative products, development of study tourism and night economy. It has promoted the sustainable development of the local economy. Tourism is a comprehensive industry and an important driving force for economic development. In recent years, under the guidance of the Global Geopark, relying on the characteristic advantage of "one industry thriving, all industries flourishing", The Geopark has created the model of "Tourism+", continuously releasing the comprehensive driving effect and vigorously implementing tourism poverty alleviation and rural revitalization, which has achieved good economic and social benefits. Some provincial designated poor villages in the Geopark have shaken off poverty and become prosperous through geotourism. Their average annual income has reached more than 50000 yuan from 260 yuan about ten years ago. Those villages have developed into well-known rich villages, national civilized towns, and new rural construction demonstration towns. From an unknown common regional scenic spot, Yuntaishan has quickly become a domestic famous Tourist attraction. The development process of Yuntaishan UNESCO Global Geopark proves that it is completely correct to protect geological heritage and ecological environment and develop popular science tourism under the guidance of scientific development concept, and it also provides ideas for the implementation of Rural Revitalization Strategy, and proves that "Tourism+" is the right choice for the sustainable development of local economy and society.

**Keywords:** Yuntaishan, Geopark, Tourism, Innovative Development, Culture

**Corresponding author:** 2020180018@qq.com

**Reference:**

Jiang Y C , Pan Y W , Xing H U , et al. THE CURRENT ISSUES OF AND APPROACH TO TOURISM IN YUNTAISHAN GEOPARK[J]. Resources & Industries, 2007. Han X M . REASON OF SUCCESSFUL OPERATION OF YUNTAISHAN GEOLOGICAL PARK[J]. Journal of Geological Hazards and Environment Preservation, 2008. Zhe W. On the Construction of Mount Yuntaishan Geopark, China and relationship with the sustainable development of the local economics[C]. Proceedings of the First International Symposium on Development within Geoparks. 2006: 1-8. Gonzalez-Tejada C, Du Y, Read M, et al. From nature conservation to geotourism development: Examining ambivalent attitudes towards UNESCO directives with the global geopark network[J]. International Journal of Geoheritage, 2017, 5: 1-20. Dowling R K, Newsome D. Geotourism destinations-visitor impacts and site management considerations[J]. 2017. Dowling R. Geotourism and geoparks[M]. Handbook of Geotourism. Edward Elgar Publishing, 2018.

## The Three Pilot - Batur UGG's programs on sustainable development

*I Gede Wiwin SUYASA<sup>1\*</sup>,  
Batur UGG<sup>1</sup> Indonesia*

Two hours north-eastern drive FROM Ngurah Rai International Airport of BALI, to the hearth of the island, is the Batur UNESCO Global Geopark, a 366 km<sup>2</sup> delineation area that 980 m up to 1717 m above sea level, consists of 48 ancient villages, two walled calderas with the spread of lavas, an active volcano and a mystical lake of Batur. The delineation of Batur UGG is congruent with the administration area of the Kintamani District. This Geopark is supposedly under second UGG revalidation in 2020, however, since the Covid-19 pandemic has not been recovered, the revalidation is delayed until further notice. Kintamani has experienced the ups and downs of tourism due to various aspects; tourism development in the 80s for the area was triggered by the opening of a national road that crosses the focal point that shows the beauty of the Batur caldera with its volcanoes and lakes. Since then, Kintamani becomes one of "the must-visit" destinations of Bali. However, community capacity was not developed well that caused several hicks up and frictions between visitors and the locals. Although it was recovered in early 90s, within a decade, the second fall was due to the excessive development of the tourism industry that lack of attention to spatial planning and environmental carrying capacity. This second fall in early 2000, forced us to redefine the development goals of the area, from which we adopted the Geopark concept and pursue membership of Global Geopark Network in 2012. Geopark concept and Tourism definition are dynamically developed. Nowadays, the UN Environment Program and UN World Tourism Organization defined Sustainable Tourism as "tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment, and host communities." Being a Geopark, our team at Batur UGG also takes full account of the past geological impact in anticipating the future impact. In this presentation, we are focusing on the three pilot programs that are related to the geoenvironmental impact of the rain forest of Suter, the degraded land of Abang Batu Dinding, and the degraded water quality of Lake Batur. The three programs are Forest Bathing, Pongamia reforestation, and Photovoltaic BWRO.

**Keywords:** Geopark, Sustainable Tourism, Forest Bathing, Reforestation, Photovoltaic

**Corresponding author:** [wiwin.visionplanner@gmail.com](mailto:wiwin.visionplanner@gmail.com)

**Reference:**

UNWTO - Sustainable Development

## Same Roots, Same Origins: a Cultural Heritage Conservation Project for Sustainable Local Development

Yu Nam CHAN<sup>1\*</sup>,

*Hong Kong UNESCO Global Geopark<sup>1</sup> Hong Kong China*

Most of the remote villages and communities in Hong Kong experienced a sharp population decline in the 1960s and 70s, as the villagers moved to the urban area or emigrated overseas. Now many of the communities are almost deserted, with only a few elderly villagers remaining. In 2017, Hong Kong Geopark started the “Same Roots, Same Origins” project, which involves actively approaching the local communities to learn about their history, culture, heritage and stories, mainly through oral history interviews of both local and overseas villagers, and then recording and transferring the information into “story rooms” ([https://www.geopark.gov.hk/en/en\\_s3p01.htm](https://www.geopark.gov.hk/en/en_s3p01.htm)) and publications ([https://www.geopark.gov.hk/en/en\\_s5p02.htm#digitalpublication](https://www.geopark.gov.hk/en/en_s5p02.htm#digitalpublication)) to help promote and conserve the heritage of the local geopark communities. The “stories” are also useful resources for education and green tourism. Training and capacity-building workshops on management and presentation skills have been provided for the local communities to empower them to operate their own “story rooms” and explain their culture and traditions. For visitors, the personal interpretation in the form of villagers telling their own stories is more interesting than an outsider explaining them. For the local communities, managing their own story rooms and promoting their communities have increased their sense of belonging. As a result, the story rooms have attracted more visitors as a tourist spot, as well as more villagers to return to their villages, either to work as docents in the story rooms, or to visit the story rooms as a focal point to treasure their own history and culture. The story rooms have helped promote local sustainable development. As a new initiative, we also established the Kat O Heritage Trail ([https://www.geopark.gov.hk/en/en\\_s2p06.htm](https://www.geopark.gov.hk/en/en_s2p06.htm)), which has small interpretation panels that suit the village environment. Despite the small size, each panel displays a graphic accompanied by an introductory text of the cultural feature to remain attractive to visitors. To learn more about the culture and history of the feature, visitors can scan the QR code on the panel to listen to stories told by the villagers.

**Keywords:** Hong Kong Geopark, oral history interview, cultural heritage conservation, story rooms

**Corresponding author:** [yn\\_chan@afcd.gov.hk](mailto:yn_chan@afcd.gov.hk)

**Reference:**

## Hot Springs Distribution For Geopark Development In Hulu Langat, Selangor, Malaysia

Mohd Hariri ARIFIN<sup>1\*</sup>,  
UNIVERSITI KEBANGSAAN MALAYSIA<sup>1</sup> Malaysia

Ministry of Education provides special platform for universities in Malaysia to conduct a community program through Service Learning Malaysia program, known as SULAM. This program aimed to educate community in Hulu Langat, Selangor on the occurrence of hot springs within their vicinity as well as disseminating public information on hot spring application. This program also recognizes local hot spring as a new geosite potential in response to Gombak-Hulu Langat National Geopark program. There are 15 locations of hot springs identified in Selangor and 5 of them located in Hulu Langat area. These 5 hot springs scattered around Kampung Jawa artesian hot water well, Batu 16, Dusun Tua, National Advanced Youth Vocational Institute (IKTBN), Sg. Serai and Sg. Lalang. The range of measured in-situ temperature for these hot springs ranging from 40.47 to 74.03°C. The source of hot water can be easily located by means of Forward Looking Infrared (FLIR) camera and later mapped into an interactive infographic map for tourist reference. Result for water analysis was tabulated in a public board for visitors' information. The minerals content from trace minerals were found to be suitable for medical use such as psoriasis and eczema. The future research works will focus on balneotherapy or treatment of disease by bathing technique in hot springs water as well as expanding the education among students and local communities involving geo-guides program, health geo-tourism industries, conservation and management workshop.

**Keywords:** Hot springs, Selangor, Malaysia, geopark

**Corresponding author:** hariri@ukm.edu.my

**Reference:**

Mohd Hariri Arifin, John Stephen Kayode, Nawawi M.N.M, Amin Khalil & H. Baioumy, 2019 , Geophysical characterization of the hot spring aquifers at Sungai Klah, EAGE-GSM 2nd Asia Pacific Meeting on Near Surface Geoscience & Engineering, Bercetak dan Elektronik, <https://events.eage.org/en/2019/eage-gsm-nsg-2019>. Mohammad Noor Akmal Anuar, Mohd Hariri Arifin, Hassan Baioumy, Che Aziz Ali, Kamal Roslan Mohamed, Akma Din, Norsyafina Roslan, Muhammad Hasiib Mansor, 2019 , Comprehensive study of hot springs potentials in lojing geothermal complex, Malaysia, The 7th Indonesia International Geothermal Convention & Exhibition (IIGCE) 2019, Jakarta Convention Center, Elektronik, <http://iigce.com/about-iigce/>. Nor Shahidah Mohd Nazer, Mohd Hariri Arifin, Norbert Simon, Norasiah Sulaiman, Mohammad Noor Akma Anuar, Muhammad Hasiib Mansor, 2019 , Public education on Geoheritage: Navigating Malaysia Hot Springs through Mobile App, Regional Geoheritage Conference 2019, Riverside Majestic, Kuching, Bercetak Nur Syazwani Izzati, Mohd Hariri Arifin & Hassan Baioumy, 2018 01, , Characterization of the newly-discovered hot springs in Malay peninsula, Regional Geoheritage Conference 2018. Hamzah Hussin, Nurulain Binti Jasme, Mohd Hariri Arifin & Tajul Anuar Jamaluddin, 2018, Subsurface investigation of jeli hot spring geosite using resistivity survey, Regional Geoheritage Conference 2018, Khon Kaen, Thailand, Bercetak dan Elektronik. Mohd Hariri Arifin, Hassan Baioumy & Mohd Nawawi. (2016), Geochemistry and geothermometry of newly discovered hot springs in Peninsular Malaysia. Extended Abstract. National Geoscience Conference 2016, Kuantan, 14 – 15 Nov 2016. Mohd Hariri Arifin, Hassan Baioumy, Mohd Nawawi, Karl Wagner and Khalil, A.E. (2015), Hot Springs at West Malaysia: An update of their distribution. Extended Abstract. National Geoscience Conference 2015, Kota Bharu, 31 July – 1 August 2015.

## Visitor management and Awareness Rising in Styrian Eisenwurzen UNESCO Global Geopark

*Oliver GULAS-WOEHR<sup>1\*</sup>,  
Styrian Eisenwurzen UNESCO Global Geopark<sup>1</sup> Austria*

The Nature and Geopark Styrian Eisenwurzen has an outstanding landscape as well as Geology and one of the last unspoilt white-water rivers in Middle Europe. White-water rafting is a very common and popular sport in the area. Many tourists come especially for practicing this activity – not only from Austria, but also from neighboring countries. In addition to that our region has a lot of hiking tourists, various Geotouristic sights, nationalparks and cultural heritage. This means a lot of diverse touristic pressure but also opportunities. Over the last years the UNESCO Global Geopark established an overlapping visitor management to ensure heritage protection and sustainable tourism. This includes our main touristic hotspot – the river “Salza” on the one hand but on the other hand other Geosights including museums, gorges, hiking trails, thematic trails, cultural heritage sites and so on. We ensure for us and all partners visibility and dissemination of knowledge. In addition to visibility at certain sites we target various groups to ensure knowledge about natural, cultural and geological protection. We especial target young people, schools and universities. We work together on a regional level with municipalities and a wide partner network. On top of that we include best practice from international level. We would like to highlight with a presentation at the GGN conference our ideas, best practice, funded projects, data and knowledge. Visitor management is a very crucial part of a Geopark management to lower the pressure of Geodiversity.

**Keywords:** Austria, Visitor management, Awarness rising, Geodiversity protection

**Corresponding author:** o.gulas@eisenwurzen.com

**Reference:**

Suske et al, Action Map of the Nature and Geopark Styrian Eisenwurzen 2021-2025

## Super Cayrou : Contemporary Art, Know-how and Geology in the Geopark of the Causses du Quercy

*Vincent BIOT<sup>1</sup>\*,  
Causses du Quercy UGG<sup>1</sup> France*

Super-Cayrou is the result of a meeting between the Geopark and the association « Derrière Le Hublot », which develops artistic and cultural projects in the region. Super Cayrou is the first work of art-refuge built as part of the « Fenêtres sur le paysage » (Windows on the landscape) project. This project aims to develop other works along the GR65 long-distance hiking trail, which is the most frequented St James Way in France.

Composed of two caselle tents (dry stone huts typical of the limestone causses) and a large esplanade to contemplate the landscape, Super Cayrou is entirely made of limestone, the local dry stone. It is a work of the present, based on ancient know-how linked to dry stone and which the Geopark, with a network of partner craftsmen and associations, is trying to perpetuate. Super Cayrou invites you to contemplate the landscapes, the cliffs and the starry sky of the Quercy limestone plateaus, to sleep in the middle of nature in a work of art, to take a break during your itinerary on the St James Way. Super Cayrou was designed by « Encore Heureux » (Still Happy), a collective of architects and artists, together with the inhabitants and the commune of Gréalou and many local actors. Meetings were organised to facilitate the participation of the inhabitants in this project. The work was carried out entirely locally: Vincent Caussanel, a craftsman-builder specializing in dry stone and a Geopark partner, coordinated and carried out the work, and the stones came from a microquarry located nearby. The quarry was opened only for this project and closed again once the stones had been extracted. This experimental initiative made it possible to supply the site with local stone while limiting the impact on the environment. No concrete, no metal, only natural and local materials for a reversible project that respects the environment. The construction work was able to take place in the spring of 2020.

**Keywords:** Contemporary Art, Dry Stone, Know-how, Cooperation, Geopark

**Corresponding author:** vbiot@parc-causses-du-quercy.org

**Reference:**

<https://www.parc-causses-du-quercy.fr/super-cayrou>

## GOVERNANCE & BOTTOM-UP APPROACH FOR SUSTAINABLE TOURISM AND LOCAL DEVELOPMENT

*Javier LÓPEZ CABALLERO<sup>1\*</sup>,  
VILLUERCAS - IBORES - JARA GEOPARK<sup>1</sup> Spain*

Villuercas - Ibores - Jara is a UNESCO Global Geopark since 2011. This is a rural area in Spain and we are managing European Found for Rural Development since 1996 (LEADER Program). The bottom-up approach is needed in all UNESCO GLOBAL GEOPARKS according to the UNESCO International Geoscience and Geoparks program (IGGP) Statutes. The question is how this goal is improved in each Geopark. Our management and governance are clear on this point; we have a Geopark Council in order to plan our main policies; In this way, our touristic activities; promotion, training courses, investment, budgets ... are made with our local companies under a Touristic Association called GEOVILLUERCAS. More than 80 little companies working together: restaurants, accommodations, guides, but also wineries, cheese, olive - oil, chestnuts, and honey factories, all of them in strong collaboration with public administrations in common projects such as GEOFOOD, quality labels, events, catalogs, international and national fairs ... But also is a crucial bottom-up approach to involve local people in the Geopark activities. In this case, our Local Action Group has a main rule: social dynamization and internal promotion, and geopark visibility. There are different commissions in order to participate and take decisions; mayors, cooperatives, associations, women, people with disabilities, youth people, local companies. they have an active paper in order to promote Geopark in out twenty municipalities. To sum up, our governance and management system is under a bottom-up approach organizing many activities and main goals to involve our Geopark. The question is how is possible working together differents public administrations with private companies and local people.

**Keywords:** Governance, management, bottom - up approach, LEADER

**Corresponding author:** javier@aprodevi.com

**Reference:**

## Astronomic tourism initiative in the Granada Geopark

*Myriam PRIETO<sup>1\*</sup>,  
Granada Geopark<sup>1</sup> Spain*

The quality of the dark nights in the Granada Geopark and the number of clear nights make it a perfect destination of ecotourism for the practice of astronomical observation. In the Granada Geopark there is a professional astronomical Observatory and surrounding the territory there are others. The Astronomical Institute of Andalusia is located in the province. All of this reflects the quality of the dark nights. During the last 5 years, the demand for this activity has increased but it is necessary offers a quality and responsible product linked to the main value of the Geopark (nature, culture and landscape). The creation of an ecotourism product, astronomical observation, is one of the objectives of the Granada Geopark. During this year, an ambitious project has been created based on the following three main pillars: 1.-Technical studies of the quality of the dark nights 2.-Design of an astronomical viewpoints network. 3.-Awareness programme aimed at touristic business, scholars and general population. A long this year and the next one, all the actions designed will be ready to offer an innovative and quality product to the visitor of the Geopark.

**Keywords:** Ecotourism, Astromony, Geopark

**Corresponding author:** mprieto@dipgra.es

**Reference:**

Astronomical Institute of Andalusia, AzimuthSpain

## Estrela UNESCO Global Geopark: Tourism Strategy for the Development of Local Communities

*Patrícia AZEVEDO<sup>1\*</sup>, Margarida MOTA<sup>1</sup>, João BRANCO<sup>1</sup>, Emanuel DE CASTRO<sup>1</sup>,  
Estrela UGGp<sup>1</sup> Portugal, Estrela UGGp<sup>1</sup> Portugal, Estrela UGGp<sup>1</sup> Portugal, Estrela UGGp<sup>1</sup> Portugal*

In 2020, Serra da Estrela territory was classified as a UNESCO Global Geopark. This is a classification that aims not only to preserve and enhance the territory, through its geological heritage, but also to leverage its cultural identity, making it a territory of opportunities. The UNESCO seal aims to promote the sustainable development of this territory, working in the most diverse areas, including Science, Education, Geoconservation, Communication, Sustainability and Tourism. In the case of the Estrela UNESCO Global Geopark, Tourism is one of the basic premises for the creation of any territorial development strategy. This sector demands are increasingly accentuated and, therefore, this Geopark has been developing a set of initiatives and actions that aim to stimulate the creation of a new tourism paradigm for the territory, based on the identity characteristics and on the tourist resources that exist in the same. For years, tourism in this territory was something designed individually, that is, by each of the municipalities. This fact greatly conditioned the structuring of a cohesive and sustainable tourist destination. In this sense, the Estrela UNESCO Global Geopark, through the tourism sector, created tools that constitute a link between the 9 municipalities that are an integral part of it: Belmonte, Celorico da Beira, Covilhã, Fornos de Algodres, Gouveia, Guarda, Manteigas, Oliveira do Hospital and Seia. In recent years, this Geopark has sought to develop projects such as the Estrela Geopark Great Route, the Estrela Geopark's Interactive Use Guide for Tourism (GUIA) and the Sustainability Card. These are actions that aim to structure, in an integrated and extended way, the territory of Serra da Estrela, constituting tourist resources and tools of great relevance for the region. The Estrela Geopark Great Route is a large-scale project and will have approximately 760 km of interconnected pedestrian and cycling routes, with a network route that includes the base trail, variants and derivations, allowing, in an integrated and complementary way, the visitation of a vast area of the Geopark territory. In the case of GUIA, it's a new tool that aims to constitute an instrument for the management, promotion and enhancement of Serra da Estrela as a tourist destination and of its products. The Estrela Geopark Sustainability Card intends to assert itself as a fundamental instrument for the sustainable management of the Geopark territory, based on two fundamental objectives: to contribute to projects in the area of sustainability and territorial development and to leverage the tourist offer of the territory, from a structured network of partners that offer discounts through the use of this Card. With the creation of these three projects, we believe that Estrela Geopark can and should be a reference example in the tourist structure of the territory and its products, always focusing its strategy on the community and on the benefits that can bring to it.

**Keywords:** Tourism Strategy, Development of Local Communities, Sustainable Development, Geotourism

**Corresponding author:** [patriciaazevedo@geoparkestrela.pt](mailto:patriciaazevedo@geoparkestrela.pt)

**Reference:**

[www.guia-geoparkestrela.pt](http://www.guia-geoparkestrela.pt)

## Estrela UNESCO Global Geopark: a year of classification

*Emanuel DE CASTRO<sup>1\*</sup>,  
Estrela UGGp<sup>1</sup> Portugal*

The Estrela Geopark is thus a key asset for implementing valorisation and territorial development policies, contributing to a greater knowledge and valorisation of endogenous resources, especially the geological heritage, as well as the secularly deepened relationship between these and human occupation. Therefore, numerous projects have been implemented that aim to achieve the most relevant goal of a Geopark: the promotion of a participatory and integrative territorial development. Ongoing, are projects such as the promotion of Heritage and traditions, the implementation of the Great Route of the Estrela Geopark, the development of integrated touristic information systems, the participation in international initiatives to share good practices with other Geoparks, the development of an educational strategy that reinforces the Estrela mountain range as the most relevant living laboratory of the country, or the implementation of an international Science and Education network. In this context, we highlight the Geoconservation award given by ProGEO Portugal, the nomination as one of the finalists of the National Tourism Award 2020, the third place in the Entrepreneurship Awards of Tourism of Centre of Portugal, among many others that have highlighted the work and relevance of this Geopark. Our recent past is also marked by the deepening of the work done in partnership with the Institute for Nature Conservation and Forests, with Tourism of Portugal and with the other Portuguese UNESCO Global Geoparks. These have been some of the numerous initiatives that took place in the last year, almost always seeking to establish a clear relationship between the Geological Heritage, the landscape of Serra da Estrela and the empowerment of its agents and communities. On this subject, we highlight the training with Tourism of Portugal in the Geotourism area or the approval, in partnership with the Polytechnic Institute of Guarda, of the Nature Guides Course for higher education students. The future for the Estrela Geopark will be one of affirmation and continuation of the work developed, with emphasis on the enlargement of the list of geosites, the improvement of its visitation and the conclusion of the Great Route project (scheduled for autumn 2022). The production of the documentary series "Estrela: a changing territory, the deepening of our network of partners, which is constantly growing, and the promotion of local products, through the GEOfood brand. This strategy will inevitably include prioritizing the value of its heritage and identity and the affirmation of its internationalization, in a future where the local communities will inevitably have to take the lead in their own development process, participating actively in the construction and development of this territory.

**Keywords:** UNESCO Global Geopark, Networking, territorial development policies, Development Strategies

**Corresponding author:** emanuelcastro@geoparkestrela.pt

**Reference:**

Estrela Geopark Website: [www.geoparkestrela.pt](http://www.geoparkestrela.pt)

## Sustainable Tourism Strategies In The Burren And Cliffs Of Moher UGGp

*Carol GLEESON<sup>1\*</sup>,  
Burren and Cliffs of Moher UGGp<sup>1</sup> 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 was 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. The first task was to create a platform for community, conservation and tourism interests to work together in aligning their own strategies and in developing an overarching policy in the main statutory planning instrument, the County Development Plan. A Geopark Heritage Map Viewer was created to provide a comprehensive inventory of Geopark geosite/heritage sites including research, development plans and surveys relating to these sites. In order to better manage environmental and visitor impacts on our geosite/heritage sites a digital online Management and Monitoring Programme was created to survey visitors, collect data and track and manage impacts. Both the Heritage Map Viewer and the Monitoring Programme assist in generating better long term sustainable site management decisions. At peak periods during the tourism season, increased tourism traffic places pressure on our environment, cultural assets and communities and the Geopark is currently working with a range of community, business and government agencies to develop a Geopark visitor management, traffic and transport plan to mitigate these pressures. 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. In support of increasing the economic, social and environmental benefits of developing and branding local produce, the Geopark recently joined the Geofood programme which promotes local food produce within Geoparks amongst local producers, restaurants, retailers, local communities and visitors. The latest development is the creation of a dynamic system of assessing and recording the sustainable tourism policies and activities of the Clare County Council/Local Authority, the Geopark's management authority, based on the Global Sustainable Tourism Councils Destination Management Criteria. The system tracks a range of management, socio-economic, cultural and environmental indicators.

**Keywords:** Development policy, site management, traffic and transport, Code of Practice, Geofood

**Corresponding author:** cgleeson@clarecoco.ie

**Reference:**

<https://www.burrengeopark.ie/sustainable-tourism/>

## Encouraging social and sustainable entrepreneurship through geoproducts in tourist communities integrated with UNESCO's Geopark Araripe World

*Maria Juliana Ferreira LEITE<sup>1\*</sup>, Francisca Jeanne Sidrim De Figueiredo MENDONÇA<sup>1</sup>, José Francisco De Sousa FIGUEREDO, Everson De Araújo MAIA<sup>1</sup>,  
URCA<sup>1</sup> Brazil, URCA<sup>1</sup> Brazil, URCA<sup>1</sup> Brazil, URCA<sup>1</sup> Brazil*

Environmental challenges emphasize the need for planning and execution of actions that effectively contribute to sustainable social progress and development. Geoparks are essential tools for the conservation and enhancement of formations and territories. One of the strategies used by Geopark Araripe is to support the development of products that evidence the riches of geodiversity, culture and regional identity. Geoproducts as well as they are known reflect the identity and experiences of communities, incorporating new technologies, boosting the local economy through commercialization and ensuring sustainability and social inclusion. As innovative approaches linked to the territory encourage local producers to undertake in a sustainable way, to achieve the objective of being a mechanism for the dissemination and valorization of geological heritage recognized by the sustainability bias. As visited communities develop the most diverse types of products, ranging from cooking to confection. All geoproducers use natural raw material and materials that are common to be found in the region aiming at creating a favorable environment for achieving the certification of their geoproducts. With the application of questionnaires and case study, it became possible to analyze the scenario and create new opportunities through the elaboration of guidelines that are directed to the main bases: quality, cultural identity, sustainability and ecodesign, with evaluation parameters and goals in the SDG st indicators that stimulate the interest of community residents to use strategy to disseminate ideas, cultural representations, natural resources and characteristics of the region as a whole, for the benefit of geoconservation, because even focused on the commercialization and sale in the development and creation of new sources of income, geoproducts should seek to show the local history, standing out as references of identity of its people and still generate long environmental impacts to that of their life cycle.

**Keywords:** Geoproducts, Entrepreneurship, Geopark, Sustainability, Geodiversity

**Corresponding author:** juliana.ferreira@urca.br

**Reference:**

HALLSTEDT, S. I. Sustainability criteria and sustainability compliance index for decision support in product development. *Journal of Cleaner Production*, v. 140, p. 251-266, 2017. HENRIQUES, M.H.; BRILHA, J. UNESCO Global Geoparks: a strategy towards global understanding and sustainability. *Review Article*, 2017. ONU - Organização das Nações Unidas. *Transformando Nosso Mundo: A Agenda 2030 para o Desenvolvimento Sustentável*. Nova Iorque: ONU, 2015a. Disponível em: <https://sustainabledevelopment.un.org/post2015/transformingourworld/publication> ONU. Momento de ação global para as pessoas e o planeta. ONUBR, 2015b. Disponível em: <https://nacoesunidas.org/pos2015/> RODRIGUES, J.; CARVALHO, C. N.; JACINTO, A. The concept of the geoproduct: successful examples from Naturtejo Unesco Global Geopark. In: Eva Almeida LIMA, E. A; NUNES, J. C. MEIRINHO, P.; MACHADO, M. *Abstracts book 14 Conference European Geoparks*, p. 134, 2017, Azores, Portugal. Disponível em: <http://www.egnazores2017.com/uploads/Abstracts.Book.pdf>.

## TOURISM INNOVATION TRANSFER PROGRAMME FOR THE ECOSYSTEM OF THE UNESCO GLOBAL GEOPARK KÜTRALKURA - CHILE

*Erika CECILIA<sup>1\*</sup>,  
Universidad Mayor<sup>1</sup> Chile*

In the territory recognised as a UNESCO Global Geopark Kütralkura, it has been found that there is abundant information on its natural and cultural heritage, which has been identified and characterised independently by specialists from different disciplines. In this context, there are several inventories (identification, characterisation and valorisation) of the geological, biological, ecological and cultural heritage, however, this information is in different scales, in scientific language, not understandable for the community and not accessible, for the most part, to the actors that form the tourism value chain of the Kütralkura Geopark. Based on the above, one of the greatest weaknesses of the territory is that there is no systematic inventory that integrates all this information into a single platform that allows: To analyse and visualise in an integrated way the heritage elements of the Geopark, which should be placed in value by the entrepreneurs of the territory in order to enhance the development of competitive geotourism experiences, as well as to allow the local development of the territory, to consolidate a holistic narrative by the actors linked to the tourism industry in the territory, to make decisions in public policies such as territorial planning by public bodies related to economic development, conservation, valuation and education of heritage and to support the development of formal, non-formal and informal educational activities with territorial relevance based on heritage, thereby promoting greater local development. Within this framework, the Programme of Transfer and Innovation in Tourism for the Kütralkura Geopark Ecosystem is being developed, executed by a university that is part of the Scientific Committee in conjunction with the Association of Cordillera Municipalities AMCA, the entity in charge of the management of the Geopark. It should be noted that this important programme is financed by the Regional Government of La Araucanía, which has supported Kütralkura since its inception. The objective of the programme is to strengthen tourism actors and entrepreneurs in the improvement and generation of new Geotourism experiences and products through an integrated management of natural and cultural heritage as part of the entrepreneurship ecosystem of the Unesco Kütralkura Global Geopark. To this end, a collaborative territorial information system is developed through a digital platform and off-line mobile application that integrates all the elements of the natural and cultural heritage and supports and contributes to the sustainability of the economic, social and environmental development programmes that they undertake, as well as developing a package of interactive digital and physical educational resources that support the permanent training and education programmes in conservation and geotourism for both tourism entrepreneurs and students of technical high schools specializing in tourism.

**Keywords:** Geotourism, Innovation and Technology Transfer, Integrated Heritage

**Corresponding author:** eka.alvarezc@gmail.com

**Reference:**

Sernageomin. 20214. Geotourism Guide of the Kütralkura Geopark

## Evolutionary study and global comparative analysis on cone karst in Xingyi Geopark

*Jichao PENG<sup>1\*</sup>,  
Xingyi Geopark Administration<sup>1</sup> China*

The Xingyi Geopark is located in the transitional slope area from the western Yunnan-Guizhou Plateau to the Guangxi basin and hills. It features not only cone-shaped karst peak-cluster depression (fengcong), but also cone-shaped peak-forest plain (fenglin), as well as peak-forest polje developed in the Triassic carbonate rocks region. More than 20,000 peaks are distributed in Xingyi Geopark, it is well-preserved, typical-developed, beautiful-appeared and known for "the best in the southwest China", which provides good examples for evolutionary study and global comparative analysis on cone karst. Therefore, this paper established a model for the genesis and evolution of cone karst in Xingyi Geopark based on the cone-shaped peaks characteristics and distribution. In addition, this paper made a global comparison of climate, stratigraphy, evolutionary process and geomorphic characteristics of similar cone karst in the world natural heritage sites, global geoparks and other natural reserves; it indicates that Xingyi cone karst is an important part to the South China Karst World Natural Heritage in terms of the Triassic stratigraphy, a textbook example cone-shaped karst in terms of landscape density, developmental strata and geomorphic evolutionary stage, and a standard cone karst combination formation including positive cone-shaped peaks, negative depression, doline, polje, canyon and caves.

**Keywords:** Xingyi geopark, cone karst, evolutionary study, comparative analysis

**Corresponding author:** xingyi\_geopark@163.com

**Reference:**

[1] Application of South China Karst. [2] Comprehensive Survey Report of Xingyi Geopark. [3] Yuan D X. Fenglin landscape[J].Guangxi geology,1984,(00):79-86. [4] Lu Y R.China karst evolutionary mode[J].Geography research,1986,(04):25-35. [5] Tony Waltham. Fenglin, fengcong, tower karst, cone karst. [6] <http://worldculturalheritagevoices.org/world-natural-heritage-list>.

## Researches and Suggestions to Actual Cases in Miné-Akiyoshidai Karst Plateau Geopark

*Manaka KAJIOKA<sup>1\*</sup>, Suzuno NAKASHIMA<sup>1</sup>, Risako FUJITA<sup>1</sup>,*

*Yamaguchi Prefectural Mine-Seiryō Senior High School<sup>1</sup> Japan, Yamaguchi Prefectural Mine-Seiryō Senior High School<sup>1</sup> Japan, Yamaguchi Prefectural Mine-Seiryō Senior High School<sup>1</sup> Japan*

With the geological features of the Miné-Akiyoshidai Karst Plateau Geopark in mind, we, three students from Mine-Seiryō Senior High School, have conducted our original research and several field work activities focusing on local agriculture and food related businesses within the area, which provide us with locally grown fresh produce as materials in restaurants or accommodations. Thanks to the sincere cooperation and kind assistance from our geopark staff members, not only were we able to enjoy the opportunities to rediscover our own hometown but also to appreciate its beauties and attractiveness again, from the perspective of visitors from outside or new settlers in our geopark. We hope that our efforts into the Miné-Akiyoshidai Karst Plateau Geopark activities this time will help promote our local industries and encourage all those striving to achieve a more fruitful future for our local community.

**Keywords:** Miné-Akiyoshidai Karst Plateau Geopark, high school students, agriculture, sightseeing business

**Corresponding author:** [obara.hokuto@mine-geo.com](mailto:obara.hokuto@mine-geo.com)

**Reference:**

## Geoeducating Students, Teachers, or Both? An Example From The Oeste Aspiring Geopark (Portugal)

Nuno PIMENTEL<sup>1\*</sup>, Bruno PEREIRA<sup>1</sup>, Inês CABAU<sup>1</sup>, Miguel SILVA<sup>1</sup>,

*Oeste aspiring Geopark<sup>1</sup> Portugal, Oesteaspiring Geopark<sup>1</sup> Portugal, Oesteaspiring Geopark<sup>1</sup> Portugal, Oesteaspiring Geopark<sup>1</sup> Portugal*

Geoeducation is one of the three pillars sustaining the development of any UNESCO Global Geopark. Usually, educational programs are thought and designed to target young students in different grades. Often, also the public of all ages uses these programs, focusing on promoting people's awareness of geological themes, as well as other thematics (e.g. biodiversity, culture, etc.). A third and crucial element of Geoeducation, not always addressed, should be the training of local and national teachers. The Oeste aspiring Geopark (OaG) has launched a comprehensive catalog of about 120 Educational Programs, targeting different school grades. These vast number of programs are already running and are carried out by more than 25 different local partners. The strategy was to assemble, organize and offer the existing educational programs in the territory, with a clear and practical remissive index by "grade" (Elementary, Secondary, etc.) and by subject (Geology, Biology, Geography, etc.). This catalog is updated yearly, sent to all schools and posted on-line on the Geopark's webpage. The advertised activities are adapted to the current pandemic situation, and can be indoor or outdoor, as well as virtual visits (to geosites and museums). We hope that this next year, with the decline of the pandemics, schools can come, visit us, and explore our territory. A second approach to Geoeducation has been to target teachers, probably the best ambassadors of any educational program. Their involvement is halfway for its promotion and success, influencing young students and their families. To implement this strategy, the OaG has been building a teaching network based on the following steps: i) contacting all the schools in the region, to present the OaG project; ii) each school nominates a representative, to serve as a linking point with the Geopark; iii) create and promote a consultive Educational Council with those representatives. This council is a consultive group that aims to aid the Geopark in different aspects, such as the promotion of geoparks and sustainable practices in schools, the analyses of the available educational programs, the advertisement of courses and workshops for teachers' training, etc. Besides this local network, the OaG is strongly involved in training teachers from around the country. We have co-organized different training sessions, designed for teachers, with both virtual/theoretical and presencial/field classes. This field component includes a visit to several of the main geosites, linking this outdoor experience with local culture and gastronomy. Upon return, these teachers use will be able to use new educational tools on their classes, based on our aspiring Geopark, thus promoting it.

**Keywords:** Geoeducation, Geoparks, Teachers, Oeste aspiring Geopark, Portugal

**Corresponding author:** nuno.pimentel@geoparqueoeste.com

**Reference:**

## AN AREA OF INTERNATIONAL SIGNIFICANCE FOR GEOCONSERVATION IN THE CENTRAL ANATOLIA: THE CAPPADOCIA ASPIRING GEOPARK, TURKEY

*Ahmet Serdar AYTAÇ<sup>1\*</sup>, Faruk BİNGÖL<sup>1</sup>,*

*Cappadocia Aspiring Geopark<sup>1</sup> Turkey, Cappadocia Aspiring Geopark<sup>1</sup> Turkey*

The Cappadocia Aspiring Geopark is located in the central part of the Cappadocia Volcanic Province in the Central Anatolia Region of Turkey. This area constitutes one of the most tectonically active regions and also one of the youngest volcanic fields in Turkey. The geopark area has a very complex structure in terms of its geology and tectonics, as a result of which, the area shows very diverse landforms. From a tectonic and geological point of view, the area has a very complex geological history. The geopark contains evidence from more than 300 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 the Earth sciences. It hosts various types of fault structures, examples of fluvial, volcanic, and karstic landforms, evidence of erosional processes, examples of topographic inversions due to differential erosion processes, and rocks and strata formed in different geological periods. This area has gained its general geomorphological appearance as a result of tectonics, volcanism, climate changes, and the establishment of the Kızıl River drainage system on the area. Besides its importance in terms of Earth sciences, the Cappadocia Aspiring Geopark is also one of the unique areas of Turkey in terms of its historical, cultural, and archaeological significance. Therefore, this area has been the home of human activities from prehistoric times to today and there is a rich heritage from Prehistoric, Hittites, Lydian, Persians, Roman, Seljuks, and Ottoman periods. The aim of this study is to introduce the international importance of the Cappadocia Aspiring Geopark in terms of earth-sciences, historical, cultural, and archaeological values.

**Keywords:** Turkey, Central Anatolia, Geoheritage, Geoconservation, Cappadocia Aspiring Geopark

**Corresponding author:** aserdaraytac@yahoo.com

**Reference:**

## Ida Madra Aspiring Geopark: 2021 UNESCO Geopark Candidate of Turkey

*Erdal GUMUS<sup>1\*</sup>, Abdullah SOYKAN<sup>2</sup>, Cahit HELVACI<sup>3</sup>, Inan ULUSOY<sup>4</sup>,  
Ida Madra Aspiring Geopark Balikesir University<sup>1</sup> Turkey, Balikesir University<sup>2</sup> Turkey, Dokuz Eylul University<sup>3</sup> Turkey,  
Hacettepe University<sup>4</sup> Turkey*

The Ida Madra Geopark is located within the Balıkesir Province; including Bergama town from İzmir Province and Ezine & Ayvaçk towns from Çanakkale Province; in the Northwest Anatolia, covering an area of 17.000 km<sup>2</sup>. The Ida Madra Geopark was established in 2019 based on the official agreement signed by the Balıkesir Governorship, Balıkesir Metropolitan Municipality, and Balıkesir University. The territory hosts 45 Geosite clustered in 11 hotshots. The Hisaralan geothermal area is home to active and fossil travertine chimneys and terraces. This natural wonder is a result of active tectonics. Active travertine chimneys form a great analogy to submarine black smokers, which are believed to be where primitive life has emerged. The hyperthermal hot springs and the ponds are vital areas for extraterrestrial life research and astrobiology. Simav graben hydrothermal mineral enrichment can be considered a firm representative of the Tethyan Metallogenic Belt to understand hydrothermal mineral enrichment and the formation of metallogenic ores. The Kozak granites (Mt. Madra) form unique topography. The integrity of the spherical granite tor boulders and oval canopied nut pine (*Pinus pinea*) forest and the Anatolian nomad culture (Yoruk) constitutes a unique landscape and cultural identity. Ancient granite quarries of the Alexandria Troas at Kestanol date back to the Archaic period used to construct "Neandria" continued during the Hellenistic period to create Alexandria Troas. The semi-processed remnant columns constitute a strong link between humans and geology and give invaluable ancient techniques. Kapıdağ granite reveals outstanding samples of exfoliation and granite topography on the southeastern part of the tombolo. Cataldağ Granite pluton is a vertical wall of 800 meters long and 250 meters tall. Ayvalık islets and coastal geomorphology hotspots consist of 22 large and tiny islets, of which 19 are designated and protected as a natural park. These islands host distinctive coastal morphologies that are characterized by cultural and architectural usage. Sahinleresi Karstic Canyon (Hawk Canyon) is a 600 m deep canyon with many karstic geosites. Mount Ida is a unique combination of geology, mythology, and biodiversity, which was declared a National Park in 1994 due to rich biodiversity. In Greek mythology, Mount Ida is one of the two sacred mountains known as the "Mountain of the Goddess." Balya's polymetallic industrial heritage is located in ancient Mysia, where polymetallic ores have been intensively mined since the Industrial Revolution. The Marmara island, which means "Marble" in Greek, gives the name to the Marble rock and to the Marmara Sea. Marmara Island's marble has been quarried since antiquities. Marmara Island also hosts the oldest marble factory, an important industrial heritage.

**Keywords:** Mt. Ida (Kazdağı), Mt. Madra (Kozak), Hydrothermal travertine chimney, Granite tor, Astrobiology

**Corresponding author:** erdalgumus08@gmail.com

**Reference:**

- Aksoy, R. (1993). Marmara Adası ve Kapıdağı Yarımadası'nın Jeolojisi. Selçuk Üniversitesi, Fen Bilimleri Enstitüsü, Jeoloji Mühendisliği Anabilim Dalı, Konya. Aral, I. Okay (-). Geology of Turkey. A Synopsis. *Anschnitt*, 21, 19-42. Atlı, A. (2018). Hisaralan (Sındırgı) Yöresindeki Traverten Oluşumlarının Bölgesel Tektonikle İlişkisi, Balıkesir Üniversitesi Sosyal Bilimler Enstitüsü, Yüksek Lisans Tezi, Balıkesir. Baykan, D. (2016). Antik Madencilik Uygulamaları. *Ancient Mining Procedure*, MT Bilimsel (Madencilik Türkiye Bilimsel Yer Altı Kaynakları Dergisi/Journal of Underground Resources) Bingöl, E., (1969). Kazdağı Masifinin Merkezi ve Güneydoğu Kesiminin Jeolojisi. *MTA Enst. Der. S.* 72, Ankara. Cürebal, İ. (2003). Madra Çayı Havzasının Uygulamalı Jeomorfolojik Etüdü. İstanbul Üniversitesi, Sosyal Bilimler Enstitüsü, Doktora Tezi, İstanbul. Cürebal, İ., Efe, R., Soykan, A., Sönmez, S. (2012). Kazdağları Ekosistemi ve Ekolojisi. *Kazdağları Ulusal Çalıştayı, Kazdağı ve Madra Dağı Belediyeler Birliği*, 2-3 Haziran, Güre- Edremit- Balıkesir, 93-111. Costas A. Thanos. (2014). Mt Ida in Mythology and Classical Antiquity - a Plant Scientist's Approach. Department of Botany, Faculty of Biology, University of Athens, Athens 15784, Greece. Delaloye, M. and Bingöl, E. (2000). Granitoids from Western and Northwestern Anatolia: Geochemistry and Modeling of Geodynamic Evolution. *International Geology Review*, 42:3, 241-268. Dilek, Y. and Altunkaynak Ş. (2007). Cenozoic Crustal Evolution and Mantle Dynamics of Post-Collisional Magmatism in Western Anatolia. *International Geology Review*, Vol. 49, 2007, p. 431–453. Doğan, A. ve Emre, Ö. (2006). Ege Graben Sistemi'nin Kuzey Sınırı: Sındırgı-Sincanlı Fay Zonu. 59. Türkiye Jeoloji Kurultayı, 20-24 Mart 2006, Bildiri Özleri Kitabı S. 83-84, Ankara. E. Bingöl et al. (1982). Granitic Intrusions in Western Anatolia: A Contribution to the Geodynamic Study of this Area. *Eclogae Geologicae Helveticae*. Erkül, F., Tatar Erkül, S., Helvacı, C. (2010). Erken Miyosen Bigadiç Bor Havzasındaki Volkanik Birimlerin Petrografik ve Jeokimyasal Özellikleri: Magma Karışımının Kanıtları, Batı Anadolu-Türkiye. *Yerbilimleri*, 31 (2): 141- 168. G. De Vecchi et al. (2000). The Genesis and Characterisation of 'Marmor Misium' from Kozak (Turkey), A Granite Used in Antiquity. *J. Cult. Heritage* 1: 145–153. Hafeli, C. J. (1966). Hisaralan (Batı Anadolu) İlıcaları Bölgesinde Yapılan Jeolojik ve Hidrolojik Etüdüleri. *Maden Tetkik Ve Arama Dergisi*, 67(67). Helvacı, C. (1995). Stratigraphy, Mineralogy, and Genesis of the Bigadiç Borate Deposits, Western Turkey. *Economic Geology*, 90(5), 1237-1260. Kocabaş, C. (2015). Clay Mineralogy and Geochemistry of Fossil and Active Hydrothermal Alteration in the Hisaralan (Sındırgı-Balıkesir) Geothermal Field, Dokuz Eylül University, Graduate School of Natural and Applied Sciences, İzmir. Konukcu, T. (2002). Marmara Adası Antik Mermer Ocakları ve Marmara Adası Mermerlerinin Güncel Değerlendirilmesi. İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Jeoloji Mühendisliği, İstanbul. Ö.I. Ece et al. (2013). Origin of The Düvertepe Kaolin-Alunite Deposits in Simav Graben, Turkey: Timing Andstyles of Hydrothermal Mineralization. *Journal of Volcanology and Geothermal Research* 255 (2013) 57–78. Soykan, A. (1993). Sındırgı ve Bigadiç Depresyonları ile Yakın Çevresinin Jeomorfolojisi. İstanbul Üniversitesi, Sosyal Bilimler Enstitüsü, Coğrafya Anabilim Dalı, İstanbul Soykan, A., (2006). The Importance of Ecotourism for Natural Park of Kazdağı (İda Mountain-Turkey). The 4th Romanian–Turkish Geographical Academic Seminar, Environment And Life, 2-11 June, Galati, Romania. Ş. Altunkaynak and Y. Yılmaz (1998). The Mount Kozak Magmatic Complex, Western Anatolia. *Journal of Volcanology and Geothermal Research* 85 (1998). 211-231. Yılmaz, Y. (1989). An Approach to the Origin of Young Volcanic Rocks of Western Turkey. İstanbul Teknik Üniversitesi, Maden Fakültesi, Jeoloji Müh. Bölümü, Maçka-İstanbul. Turkey. Yılmaz, Y. Et. Al (2000). When Did The Western Anatolian Grabens Begin to Develop? *Geological Society London Special Publication*.

## Kefalonia-Ithaca Aspiring Geopark

*Elena ZOUMPOULI<sup>1\*</sup>, George DRAKATOS<sup>1</sup>, Michael XANTHAKIS<sup>1</sup>, Maria BOURBOULI<sup>1</sup>, Panagiotis MINETOS<sup>1</sup>, Avraam ZELILIDIS<sup>2</sup>,  
Nicolina BOURL<sup>2</sup>, Maria KOLENDRIANOU<sup>3</sup>, Maria TSONI<sup>3</sup>  
Kefalonia-Ithaca Geopark<sup>1</sup> Greece, Kefalonia-Ithaca Geopark<sup>1</sup> Greece, Kefalonia-Ithaca Geopark<sup>1</sup> Greece,  
Kefalonia-Ithaca Geopark<sup>1</sup> Greece, Kefalonia-Ithaca Geopark<sup>1</sup> Greece,  
University of Patras, Department of Geology, Laboratory of Sedimentology, Patras, Greece<sup>2</sup> Greece,  
University of Patras, Department of Geology, Laboratory of Sedimentology, Patras, Greece<sup>2</sup> Greece,  
University of Patras Department of Geology Laboratory of Palaeontology and Stratigraphy, Patras<sup>3</sup> Greece,  
University of Patras Department of Geology Laboratory of Palaeontology and Stratigraphy, Patras<sup>3</sup> Greece*

Kefalonia–Ithaca aspiring Geopark, this small area on the planet earth represents an aspiring geopark of particular importance, which consists of several interesting geosites. It is the result of the combination of lithospheric plate movements and climatic influences which is reflected in faults, karstic geomorphs, wetlands, paleontological sites, as well as many other geomorphs. Specifically, Kefalonia–Ithaca aspiring Geopark is an island complex (Kefalonia-Ithaca-Atokos-Arkoudi) belonging to the Heptanese of the Ionian Sea. It is located at the westernmost part of the Hellenic arc where the African plate is subducted under the Eurasian one. Thus, the region is characterised by significant tectonic activity and is considered the area with the highest seismicity in Europe. On the two islands there is an excellent depiction of these earth processes which present these great geotectonic features underlining the force of the collision of the two plates, through a wide variety of geological features. The most striking geological feature of the islands though, is the exceptional karstic network connecting the Sinkholes of Argostoli (located at the western part of the Kefalonia Island) with the cave system in Sami area (located at the eastern part of the island) presenting a unique geological phenomenon due to its extent (about 15 km) and extraordinary beauty. Sea water enters the Sinkholes of Argostoli and 15 days later after passing through the karstic network under Aenos Mountain and mixing with fresh water, it comes out at Karavomilos springs in the area of Sami as brackish water. Kefalonia-Ithaca aspiring geopark has until now evaluated and designated 50 geosites. The rich geological heritage is accompanied by an exceptional natural environment with rich flora and fauna and particularly interesting biodiversity which is indelibly linked with the geodiversity. Moreover, Kefalonia and Ithaca are islands of historical interest with a rich cultural heritage, and an abundance of many monuments and sites that testify human activities and civilization from the prehistoric period to modern times, and which are connected with their geological heritage. For example, the island of Ithaca is known worldwide as the homeland of Odysseus from the Homeric sagas, Iliad and Odyssey. The story of Odysseus has occupied a multitude of archaeologists and historians which have resulted in a plethora of scientific research and publications from institutes around the world about Ithaca, but also receive a significant number of tourists who want to visit and see the land of the mythical hero.

---

**Keywords:** Kefalonia-Ithaca aspiring Geopark, karstification network, high seismicity

**Corresponding author:** zoumpouel@gmail.com

**Reference:**

Karsthydrologische Untersuchung auf Kephallenia. MAURIN, V., ZÖTL, J., 1963. Österreichische Hochschulzeitung 12 Maurin V, Zoetl J (1967) Salt water encroachment in the low altitude karst water horizons of the island of Kephallinia (Ionian Islands). IAHS Proc. Symposium "Hydrology of fractured rocks", Dubrovnik, Croatia, Oct. 1965, p. 423–438. Drogue C (1989) Continuous inflow of seawater and outflow of brackish water in the substratum of the karstic island of Cephalonia, Greece. *Journal of Hydrology*, 106(1-2), 147–153. The Caves of Cephalonia. HOOPER, J., 1982. *Devon Speleological Society Journal* 123, 5-9. The 1953 earthquake in Cephalonia (Western Hellenic Arc): coastal uplift and halotectonic faulting S. C. Stiros, P. A. Pirazzoli, J. Labore and F. Laborel-Deguen ' Institute of Geology and Mineral Exploration (IGME), 70 Mesoghion St, Athens 11527, Greece CNRS-URA 141, Laboratoire de GPographie Physique, Place Aristide Briand, 92190 Meudon-Bellevue, France Laboratoire de Biologie Marine, Universite de Marseille II, Luminy, case 901, 13288 Marseille Cedex 9, France The Kefalonia Transform Fault: A STEP fault in the making Ali Değer Özbakıra, Rob Goversa, Andreas Fichtnerb a Department of Earth Sciences, Tectonophysics group, Universiteit Utrecht, the Netherlands b Department of Earth Sciences, ETH Zürich, Zürich, Switzerland. The geodetic signature of the Jan 26, 2014 earthquake onshore Cephalonia, Greece. A. Ganas, F. Cannavò, P.J. González and G. Drakatos Athanassios Ganas, NOA, Flavio Cannavò, INGV-Catania, Pablo J. González, University of Western Ontario, George Drakatos, NOA Combined Seismicity Pattern Analysis, DGPS and PSInSAR studies in the broader area of Cephalonia (Greece) E. Lagios a, P. Papadimitriou a, F. Novali b, V. Sakkas a, A. Fumagalli b, K. Vlachou a, S. Del Conte Tectonophysics Volumes 524–525, 20 February 2012, Pages 43-58

## Impact Crater Lake Geopark aUGGp

*Heikki MARTIKAINEN<sup>1\*</sup>,  
Impact Crater Lake Geopark<sup>1</sup> Finland*

Lappajärvi, Finland is a coherent geographical area in Western Finland with significant geological heritage and ecological, archaeological, historical and cultural significance. Geopark is based on a true geological base that is an internationally unique and interesting place to explore. Lappajärvi is Europe's largest impact crater lake formed 78 million years ago by a meteor crash. The effects are still visible and experienced in the area. Take an exciting VR-journey and experience meteorite crash and the birth of lake. The Geopark area is a great destination for geotourism and business start-ups, innovation and international cooperation. As a tourist destination the Geopark area offers good outdoor activities and interiors for both winter and summer activities. In Lappajärvi you find Meteorite, Rock and Mineral Exhibition, where you may touch authentic meteorites or embark on Virtual Reality tour to the asteroid belt. Just nearby in Evijärvi you can find pillow lavas (eruption under the sea) or watch very rare birds from a watchtower. In Vimpeli, on the crater rim, Lakeaharju has a tower with best view of the whole crater. Famous Finnish architect Alvar Aalto has his first work in Alajärvi and many other buildings forming the Aalto Center. In southern part of the Geopark you have a great opportunity to experience beautiful hiking trail from Soini to Ähtäri town where Finland's oldest natural environment zoo is located. Most of the animals there are typically found in boreal forests in the wild. On the Geopark area you find quality hotels, cottage accommodation and plenty of restaurants. Geopark area has two 18-fairways golf courses in the beautiful lakeside scenery, two fully equipped bowling alleys, two indoor ice rinks and three spas. But most important for us and for our visitors are the trails in the pure natural environment. If you do hiking, cycling, canoeing, walking, fishing or swimming don't forget to experience the traditional pair-dance pavillions in Vimpeli, Ähtäri or Lappajärvi. More information [www.kraatterijarvigeopark.fi](http://www.kraatterijarvigeopark.fi)

**Keywords:** Impact Crater Lake, Lappajärvi

**Corresponding author:** [heikki.martikainen@lappajarvi.fi](mailto:heikki.martikainen@lappajarvi.fi), +358 443699621

**Reference:**

PhD Heikki Mäkipää

## Aspiring Costa Quebrada Unesco Global Geopark Project

*Gustavo GUTIERREZ<sup>1\*</sup>, Jesús MOJAS<sup>1</sup>, Viola Maria BRUSCHI<sup>2</sup>,  
Asociación Costa Quebrada<sup>1</sup> Spain, Asociación Costa Quebrada<sup>1</sup> Spain, Universidadde Cantabria<sup>2</sup> Spain*

In 2002 a civil society group (Asociación Costa Quebrada, ACQ) was formed to help in the clean-up of one coastal sector in Cantabria, N Spain, affected by the Prestige tanker accident. Contact between academia and ACQ members raised their awareness about the geological value and singularity of this coast, and they started a series of activities for the conservation and promotion of its geological heritage. Costa Quebrada is a coastal sector, and adjacent inland, between the bay of Santander and Santillana del Mar, of about 372 km<sup>2</sup>, including eight municipalities. The geological character of this sector is determined by a syncline of Cretaceous-Eocene sedimentary rocks, with strata ranging from parallel to perpendicular to the coastline. Coastal and karst processes acting on the variety of rock types present, have produced a wide range of landforms, determined by the erosion/sedimentation interplay. The excellent accessibility and observation conditions along the whole coastal sector, together with its outstanding scenic value, make it ideal for explaining and understanding processes in, and evolution of, a retreating coast. During the last couple of decades ACQ, in collaboration with, or the support of, the Universidad de Cantabria, Government of Cantabria, local authorities and private business in the area, has undertaken a growing number and variety of activities. Among the results so far obtained: a successful brand name, "Parque Geológico de Costa Quebrada" (PGCQ – Costa Quebrada Geologic Park)", has been firmly established; a formerly existing Natural Park has been expanded to include the territory and geologic heritage of Costa Quebrada; information panels have been installed; educational visits and restoration activities are regularly organised; the central sector of the park has been included by the Geological Survey of Spain (IGME) as a Global Geosite; appreciation of this heritage among all sorts of institutions, the media and general public has increased considerably. A new step was taken some three years ago, when it was decided to seek nomination of Costa Quebrada as a Unesco Global Geopark. The objective of this contribution is to explain the main characteristics and values of the area, describe the actions already carried out and the results achieved, as well as the steps which have led to the Aspiring Costa Quebrada Unesco Global Geopark Project.

**Keywords:** Costa Quebrada Geologic Park, Application Dossier, Unesco Global Geopark, Aspiring Project, Spain

**Corresponding author:** gustavo@costaquebrada.com

**Reference:**

BRUSCHI, V. & REMONDO, J. (2019). The Cantabrian rocky coast. JA. Morales (Ed.). Spanish coastal systems: Dynamic processes, sediments and management. Ed. Springer, pp. 79-92.

## The Aspiring Cotentin Geopark, a Geotouristic Destination to Built

*Jacques AVOINE<sup>1\*</sup>,  
University of Caen<sup>1</sup> France*

Located along the south coast of the English Channel, the Cotentin is mainly a rural territory, with a population living in 129 municipalities, dont 4 main cities. The coastline shows various forms: rocky coasts, cliffs, dunes, estuaries, sand and pebble beaches, contrasting with peaceful green valleys, small woods, streams, hedgerows in the countryside. Strong geological contrast exists between the Proterozoic and Paleozoic formations of the Armorican Massif to the west and Mesozoic and Cenozoic Paris Basin to the east, inside which 61 geosites have been identified. The great diversity of rocks his refound in houses, farms, mills, castles, which constitute a part of the tangible cultural heritage. Archeology is also well documented since Neanderthal period. More modern cultural heritage is rooted in traditional agriculture practices and productions. Intangible heritage, local languages, cultural traditions, viking influence are still alive, and relayed by the local population and several museums. Since 2013, because of the richness of this territory, the Normandy Geoheritage Association has been defended the idea of creating a Cotentin geopark. This project has been presented to all the French geoparks and during European and Global geopark meetings, and lately to the participants of the last International Intensive Course on UNESCO Global Geoparks held in June 2021. We have never stop promoting a global Cotentin Geopark project, which that makes sense at the right scale, even if there is a potential project inside the Cotentin area defended by a single municipality. Now we have to move on, to learn how to do and to act at our level, with all the partners who wish to move forward together through all the aspiring geopark territory. For that, an association is being created, dedicated to build all together a geotourism project for the territory, first step of a future candidacy of the Cotentin area to the Unesco global geopark label. To do this, inhabitants of Cotentin are invited to contribute to this action, they are them who will become the best ambassadors of their territory.

**Keywords:** Cotentin, Geopark, Geotourism, Bottom up action

**Corresponding author:** [avoinej@aol.com](mailto:avoinej@aol.com)

**Reference:**

Baillet L, Avoine J, Dupret L. 2018 - Manche. Omniscience Ed., 256 p.

## The Joyce Country and Western Lakes aspiring Geopark; rich geodiversity, contrasting landscapes, and putting the Irish language front and centre

*Benjamin THÉBAUDEAU<sup>1</sup>, Amrine DUBOIS GAFAR<sup>1\*</sup>,*

*Joyce Country and Western Lakes aspiring geopark<sup>1</sup> Ireland, Joyce Country and Western Lakes aspiring geopark<sup>1</sup> Ireland*

The Joyce Country and Western Lakes aspiring geopark has been funded during 2020-2021 mainly by the Irish Government and supported by local government, the national Tourism Agency and Geological Survey Ireland. The main aim was to apply for UNESCO Global Geopark status by the end of 2021 and become the newest Irish member of this international network. Located in the west of Ireland to the north of the Connemara region in the counties of Mayo and Galway, the region is well-known to geologists, particularly in Ireland, Britain, and North America, for having the most complete record of the Ordovician to Devonian Grampian-Taconic orogeny. Notable outcrops include Connemara Marble, the Lakes Marble in Cur Hill and the pillow basalts of the Lough Nafoe Arc. The region has Ireland's only fjord at Killary Harbour, and many other glaciological features, the karst and epikarst landscape on the shores of Loughs Mask and Corrib, and a very rare marl lake at Lough Carra. The rich geodiversity of the region translates into a multitude of habitats, large areas of which are protected within the European Union NATURA 2000 network. A third of the region is a Gaeltacht, i.e. a region where the Irish language is still spoken regularly as a first language. It comprises of 20 villages and towns with a total population of around 20,000 people, mostly residing to the east of the region. Despite its natural beauty, the wealth and breadth of available activities, exploration and education opportunities are often overlooked by visitors and locals. Our aspiring Joyce Country and Western Lakes Geopark not only promotes the internationally significant geology and environment of the region but also aims to be a driver of sustainable rural development for its communities. This talk will introduce the region, highlights of its geological, environmental, and cultural heritage as well as the development activities undertaken in recent years and the roadmap for its future.

**Keywords:** Ireland, Irish, Gaeltacht, Education, Sustainable development

**Corresponding author:** geologist@jcwlgopark.ie

**Reference:**

## Intangible cultural heritage as an economic driver in sustainable tourism

*Darren RICE<sup>1\*</sup>,*

*Newry Mourne and Down District Council<sup>1</sup> United Kingdom*

People have inhabited the Mourne Gullion Strangford aspiring UNESCO Global Geopark (aUGG) 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 stories of ancient traditions, lost religions and power struggles are written across the mountains, drumlins, plains and coasts. The breath-taking landscape of Mourne Gullion Strangford aUGG has been an inspiration to artists, musicians and many more throughout the ages. This can be heard in the music festivals throughout the summer and also in local village “sessions” every week. Traditional instruments such as the Uilleann Pipe and Harp are hand crafted here, the skill passed down through generations. However, across the European Atlantic Area, areas are experiencing the same problems of cultural decline in the context of very similar starting conditions. The drivers for this decline are demographic change, agricultural intensification, lower employment rates and globalisation. Behind these, are common processes such as peripherality and the poor visibility this brings about on the relatively remote west of more urbanised land masses, poorer employment prospects for young people, lower vibrancy, and an erosion of cultural cohesion. These processes and drivers can be challenged by seeking out positive elements of the cultural position our communities face and using them to create economic and cultural vibrancy. Atlantic CultureScape (ACS), a project developed in 2018 and implemented from 2019 through 2022, is developing sellable experiences rooted in intangible cultural heritage (ICH), which will enhance the lives of those who live, work and visit here. An analysis of the intangible cultural heritage tourism offering was carried out in order to provide guiding principles for sustainable economic growth and significant opportunity was identified to develop place-based ICH experiences. ACS is harnessing the experience and skills of all partners and their local communities to restore that vibrancy through ensuring that intangible cultural traditions are protected and enhanced whilst at the same time enabling them to contribute by becoming part of the local economy. The ‘intangible’ element of cultural heritage has received relatively little attention in Atlantic Area in recent years. Others have looked at exploiting cultural heritage as a whole and several other projects have worked on the exploitation of physical heritage, but the imaginative culture passed on through generations has received little development. Yet it is the authentic experiences of local culture that draws visitors to an area. Increasingly tourism is part of the ‘experience economy’ and this project is ensuring this is exploited in a way that reinforces its values and strengthens community identity, rather than acting as an extractive industry.

**Keywords:** Intangible Cultural Heritage, Sustainable Tourism, Mourne Gullion Strangford, aspiring UNESCO Global Geopark, Atlantic CultureScape

**Corresponding author:** darren.rice@nmandd.org

**Reference:**

Atlantic CultureScape project

## Building Continents and Societies

*Brynjar STAUTLAND<sup>1\*</sup>,  
Geopark Sunnhordland<sup>1</sup> Norway*

Most of the current growth of continents are related to magmatism associated with island arcs and continental arcs. Today, this growth takes mainly place along subduction zones within and along the margins of the Pacific Ocean. Old mountain ranges represent ancient growth zones, and within Sunnhordland Geopark two of the major ancient growth zones on Earth are juxtaposed. Whereas the oldest zone formed by continental arc magmatism, the younger formed by island-arc magmatism and by arc-continent and continent-continent collision. The variety of plutonic and volcanic rock complexes that are exposed within these contrasting terrains display the rock types that make up the crust. The geology of the geopark is unusually varied. Within a small area a wide range of magmatic, metamorphic, and sedimentary rocks give insight into the deep crustal and surface processes that build continents. This geology is exceptionally well exposed in spectacular and contrasting landscapes shaped by glaciers. The eastern part the territory is composed of an alpine and partly glaciated terrain that is crosscut by deep fjords. Westwards the landscape transforms into a low-relief archipelago composed of several thousand smaller and larger islands. A wide diversity of rock types, landscapes and climate zones result in habitats that range from the harsh environments of the glaciated mountains and the wave-washed skerries - to the rich boreal rain forests. A national park covers the glacier and the surrounding mountainous areas, and more than 50 natural reserves have been established within the archipelago. This landscape became exposed as the ice rapidly retreated around 11.000 years ago. The territory then became colonized by life and inhabited by humans. Stone age settlements started mining of the raw materials, and greenstone from the area became a valued commodity spread widely along the Norwegian coast. Numerous mines were later established as the demands for building materials, industrial minerals and metals developed. Today the landscape continues to sustain the society. The archipelago harbours fish farming, the glaciated mountainous areas support hydroelectric power production and aluminium production plants, and the sheltered deep fjords enables the construction of platforms for offshore petroleum industry and for the harvesting of wind energy. The diversity and quality of the exposures in the territory was recognized as a gift for teaching and training almost hundred years ago: The landscape is so distinct in its form, and so varied in display, that in many ways it can be viewed as a lecture book in geology. Since then, the area has been extensively used as a training-ground for students. Several thousand geology students enrolled at University of Bergen have had their first eye-opening field experiences in this area. The territory continues to be a key area both for elementary and more advanced training, as well as for research in geology, archaeology and botany.

**Keywords:** Continental arc magmatism, Island arc magmatism, Quartarian impact, Culture, education

**Corresponding author:** brynjar@geoparksunnhordland.no

**Reference:**

Dr. Rolf Birger Pedersen

## Description And Characterization Of British Columbia's Fire & Ice Aspiring Geopark

*John RAE<sup>1\*</sup>,*

*Resort Municipality of Whistler<sup>1</sup> Canada*

The mountainous Sea to Sky corridor of British Columbia's south coast is Canada's most geologically active area—a land shaped by 200 million years of tectonic uplift and subduction, terrane accretion, volcanic activity, continental glaciation, and large-scale wasting events that include debris flows, avalanches, flooding, and landslides resulting from the interaction of natural geomorphological processes and, increasingly, the weather extremes of a changing climate. The proposed ~10,000 sq. km Fire & Ice Aspiring Geopark encompasses a significant part of the Sea to Sky region and adjacent areas of significance in the Garibaldi Volcanic Belt. From coastal rainforest to dizzying peaks, lava flows to thundering waterfalls, submarine moraines to fumaroles steaming through the fractured glacier of a dormant volcano, some 70 geosites tell an end-to-end story of ongoing mountain-building, glaciation, volcanism and collapse—four geological pillars around which the geopark's interpretive pedagogy will be woven. Of particular note are numerous examples of supra- and subglacial ice-contact lava formations. The geopark sits wholly within the unceded, shared traditional territories of Indigenous Peoples: the coastal-dwelling Squamish First Nation and the interior Lil'wat First Nation, which enjoy a unique ancient partnership on these lands, with several prominent skyline landforms reflecting key cultural waypoints and origin stories. The geological diversity of the Sea to Sky landscape has also underpinned its development as a globally recognized tourism destination, priming the corridor to function as a de facto geopark. Already an abundance of activities, attractions and interpretive materials curate experiences and educate around geological phenomena and geohazards, biodiversity and ecological processes, Indigenous culture and mythology, and post-contact industrial history. The Fire & Ice Aspiring Geopark seeks to unite these efforts under a collective stewardship banner, as well as promote the area's natural and cultural values as part of a more integrated and sustainable regional tourism vision. A 15 per cent overlap of the geopark area with the newly designated At'l'ka7sem/Howe Sound UNESCO Biosphere Region adds additional impetus and opportunities to this effort. Development will begin with infrastructure for easily accessed core sites in the Whistler area, expanding north and south with Indigenous, municipal, and provincial partner jurisdictions. Those living in the region have always adapted to the diverse, dramatic and dynamic landscape for both livelihood and recreation, welcoming the world to enjoy, respect and celebrate it with them. We are just now beginning to appreciate the role of its geological uniqueness and deep-time processes in our lives. The Fire & Ice Aspiring Geopark will offer a passport to this intriguing past—and an ever-evolving present.

**Keywords:** Whistler, Squamish, indigenous, geopark, glaciovolcanism

**Corresponding author:** jrae@whistler.ca

**Reference:**

Fire & Ice Aspiring Geopark Steering Committee, Resort Municipality of Whistler, British Columbia, Canada

## The Appalachian Geopark: An Aspiring Geopark from West Virginia, USA

*Robert BURNS<sup>1\*</sup>, Jasmine CARDOZO MOREIRA<sup>2</sup>,  
West Virginia University<sup>1</sup> United States, Ponta Grossa State University<sup>2</sup> Brazil*

The Appalachian Geopark Project (AGP), initiated in 2015, will encompass three West Virginia (US) counties (Fayette, Raleigh and Greenbrier), covering nearly 6,000 km<sup>2</sup>, with a total population of 160,000 (Burns et al. 2016). The Project synthesizes existing National, State, and local parks and forests of southern West Virginia under one umbrella. Includes critical touristic landmarks, embracing: New River Gorge, Gauley River, historic monuments, springs, karst, caves, Thurmond, rail heritage, coal heritage, Greenbrier River Trail, water and geological formations of international significance, WVU Beckley campus, Bechtel Summit, and more. AGP is named for the Appalachian mountains in which it is situated, as well as the Appalachian culture that it highlights. West Virginia, the “Mountain State” is totally encompassed within Appalachia, the only state that is situated completely within Appalachia. (Appalachian Regional Commission, 2021). West Virginia University holds steadfast to its mission of delivering high-quality education, excelling in discovery and innovation, modeling a culture of diversity and inclusion, promoting health and vitality, and building pathways for the exchange of knowledge and opportunity between the state, the nation and the world. The scope of the Appalachian Geopark advances the University's land-grant mission, as well as service, collaboration, and economic enrichment of the state. The role of West Virginia University in the AGP is to initiate progress and secure support from federal/state governments and local citizens before turning it over to a non-governmental entity. This opportunity can bring economic development in rural communities through national/ international tourism. Also, utilizing existing infrastructure – no new restrictions, no new land use. The goals with this project are link tourism to sustainable community development, as measured by increased economic impact in the communities. Also, jump-start local small businesses (e.g., outfitter guide companies, angling guides, etc.).

**Keywords:** Appalachia USA, Coal Heritage, Aspiring Geopark, geoheritage, West Virginia

**Corresponding author:** robert.burns@mail.wvu.edu

**Reference:**

Appalachian Regional Commission. (2021) About the Appalachian Regional Commission. <https://www.arc.gov/about-the-appalachian-region/> (assessed March 22, 2021). Burns R.C., Moreira J. C., Robinson D, Kicklighter T. (2016) Appalachian Geopark Proposal: Heritage and hopeful future in the mountain state of West Virginia, USA. In: Abstract Book. 7th International Conference on UNESCO Global Geoparks. English Riviera Geopark.

## Cajón Del Maipo (Chile): an Aspiring Geopark with World - Class Potential

*Camilo VERGARA DASKAM<sup>1\*</sup>, Macarena VALLEJOS BUSTOS<sup>2</sup>, Cristóbal ESTAY DASKAM<sup>1</sup>, Anthony PRIOR CARVAJAL<sup>1</sup>, FUNDESO Cajón del Maipo<sup>1</sup> Chile, Universidad Tecnológica Metropolitana<sup>2</sup> Chile, FUNDESO Cajón del Maipo<sup>1</sup> Chile, FUNDESO Cajón del Maipo<sup>1</sup> Chile*

Cajón del Maipo aspiring Geopark is a ~ 5,000 km<sup>2</sup> mountainous territory located in the Andes Cordillera of central Chile. The project has been developed since 2017 with the main goals of providing economic opportunities for the local community and promoting the sustainable management of natural and cultural heritage.

The Cajón del Maipo aspiring Geopark has three characteristics that allows us to affirm that it is a project with a world-class potential for success as a future UNESCO Global Geopark:

1. Geoheritage of international significance: This territory is in the heart of the Andes Mountain range, one of the most active and interesting geological contexts in the world. With several peaks above 6,000 meters of altitude, the landscape quality is outstanding and its geodiversity includes: three active stratovolcanoes, more than 800 glaciers affected by climate change, a wide variety of tectonic structures, and recurrent landmass movements, associated with geohazards for local communities. In the geoheritage inventory are recognized 40 geosites, five with international scientific relevance, and more than 20 with high touristic and educational potential (Vergara and Estay, 2020).

2. Proximity to the capital of Chile: Cajón del Maipo is located 50 km away from Santiago, the capital city with 7 million inhabitants, that hosts the biggest international airport of the country. Santiago is the main economic and political center at the national level, and has hundreds of schools, universities and tourism agencies that are potential users of the Geopark. Cajón del Maipo is a highly visited tourist destination and has presented a sustained growth in the tourist offer and in the number of visitors in the last two decades (pre COVID-19).

3. Real bottom-up approach: This geopark has been developed with a strong community involvement, born from grassroot organizations based in the territory, escalating from the local to the regional, national and international level. The management structure has progressively increased in support and capacity, including to date the participation of universities, local schools, public services, private associations and numerous volunteers and NGOs.

In the last 4 years, actions and initiatives have been implemented in different areas of work, including: geoheritage research and geoconservation; geotourism and geoproducts; education for sustainability; and networking at local, national, and international levels. This year, the project is consolidating its management structure, developing a 5-year strategy, and preparing the application dossier as a UNESCO Global Geopark, which will be presented in 2022.

**Keywords:** Cajón del Maipo, aspiring Geopark, Geotourism, Geoheritage, The Andes

**Corresponding author:** camilosaxo@gmail.com

**Reference:**

Vergara, C. and Estay, C. (2020). Cajón del Maipo aspiring UNESCO Global Geopark, Central Chile: Outstanding geological heritage as a tool for local development. Oxford Geoheritage Virtual Conference, Oxford University Museum of Natural History.

## Where The World Meets - Description And Characterization Of The Niagara Peninsula Aspiring Global Geopark

*Darren PLATAKIS<sup>1\*</sup>, Ian LUCAS<sup>1</sup>, Perry HARTWICK<sup>1</sup>, Michael RIPMEESTER<sup>1</sup>, John MULLIGAN<sup>1</sup>,*

*Niagara Peninsula Aspiring Global Geopark<sup>1</sup> Canada, Niagara Peninsula Aspiring Global Geopark<sup>1</sup> Canada, Niagara Peninsula Aspiring Global Geopark<sup>1</sup> Canada, Niagara Peninsula Aspiring Global Geopark<sup>1</sup> Canada, Niagara Peninsula Aspiring Global Geopark<sup>1</sup> Canada, Niagara Peninsula Aspiring Global Geopark<sup>1</sup> Canada*

The Niagara Peninsula Aspiring Global Geopark (NPAGG) is underlain by a sequence of shales, sandstones, limestones and dolostones of middle Ordovician to middle Devonian age which rests unconformably on sloping basement rocks of the Grenville Province of the Canadian Shield, roughly 1.5 billion years old. Bedrock is exposed in four main outcrop areas. 1) The entire Geopark is underlain by the Queenston Formation, an extensive red shale clastic wedge up to 300 m thick, deposited over a period of 15 million years at the end of the Ordovician. The top of the Formation marks the Ordovician-Silurian extinction event, where 85% of all species were eliminated. 2) Lower Silurian stratigraphy is exposed along the Niagara Escarpment. 3) This same Lower Silurian sequence is exposed along the walls of the Niagara Gorge, a magnificent 11 km long channel formed by river erosion over the last 12,000 years. 4) The fossiliferous Lower Silurian Onondaga Formation limestone is exposed in various locations along the Lake Erie shoreline overlies the softer Bois Blanc limestone, and as the cap of the Onondaga Escarpment, intermittently visible up to 10 m in height. The underlying Upper Silurian stratigraphy, consisting of shale, evaporate and limestone remain unexposed under glacial and lacustrine overburden. Results of continental glaciation can also be seen throughout the Geopark in a number of geomorphological features. The proposed 1,854 km<sup>2</sup> geopark is home to nearly half a million people in 12 diverse municipalities. The world-famous Niagara Falls are the region's most prominent and well-known features, attracting millions of both domestic and international tourists every year. Hydro-electricity generation at the Falls drove development of large industrial complexes in Niagara's cities, which was also aided by the construction of the Welland Canal. The Niagara region boasts some of the most productive soils in Canada and is reflected in a landscape still dominated by family farms and small towns. More recently, these fertile soils and a moderate climate have bred a world-renowned grape and wine industry. The geopark includes indigenous Haudenosaunee and Anishinaabe people. For millennia, they have used Niagara as a place for meeting, trading, sharing stories, harvesting food and establishing strong family and cultural ties. Today, Niagara remains home to many First Nations, Metis and Inuit peoples. Niagara's geology tells its story in a captivatingly accessible visual display while our communities feature a colourful cultural history. A short list includes: Indigenous culture centres, picturesque Niagara-on-the-Lake, the terminus of the Underground Railroad in St. Catharines, the legacy of the War of 1812, and local cultural and music festivals across the region. The proposed Geopark has the potential to provide a sustainable and unifying approach to the existing tourism industry while promoting a wide range of immersive experiential opportunities.

**Keywords:** Niagara, Ontario, Canada, Aspiring Geopark, Sustainable Tourism

**Corresponding author:** [geospatialniagara@gmail.com](mailto:geospatialniagara@gmail.com)

**Reference:**

## Charlevoix Geopark's Geological And Astronomical Heritage

*Pierre VERPAELST<sup>1\*</sup>,  
Science@CECC - Charlevoix Aspiring Geopark<sup>1</sup> Canada*

The Charlevoix region has witnessed at least 1,5 billion years of Earth's history. It is located at the intersection of three major geological provinces found in Canada, allowing to view a wide variety of geological environments and features: the Canadian Shield, the St. Lawrence Platform and the Appalachians allowing to view a wide variety of geological environments and features. The region has also gone through a series of glaciations with the last one ending 10,000 years ago. Yet the highlight of Charlevoix is its astrobleme: literally a wound left in the Earth's crust that was caused by a meteorite impact more than 400 million years ago. Satellite images show the contour of the ancient crater as well as the central uplift left by the impact. Surface mapping has allowed to discover traces and further proof of the meteorite impact such as shatter cones and impact breccias. The imprint of the impact [...] left a topographic depression, characterized by a microclimate. This privileged area made the region suitable for human establishment, years before the arrival of European explorers. The space origin of the Charlevoix Astrobleme is also an opportunity to go beyond the geoheritage of Charlevoix and explore its "astroheritage", i.e., 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. Multiple activities have been put in place already in the future Géoparc de Charlevoix: Astronomical and Astrobleme Observatories, Geotrail, guided geological tours, educational program and interpretation trails, enhancement of historical sites. Plus, the region has other sites yet to be discovered and explained. Efforts are currently 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.

**Keywords:** Charlevoix Aspiring Geopark, astrobleme, shatter cones, astroheritage, geotourism

**Corresponding author:** verpapi@yahoo.ca, jmg@astronomiecharlevoix.org

**Reference:**

## SUSCEPTIBLE AREAS TO FLASH FLOOD AND DEBRIS FLOW IN CAMINHOS DOS CANIONS DO SUL ASPIRANT GEOPARK - SOUTH BRAZIL

*Maria Carolina Villaça GOMES<sup>1\*</sup>, Marina Tamaki De Oliveira SUGIYAMA<sup>1</sup>, Jairo VALDATI<sup>1</sup>,  
UDESC<sup>1</sup> Brazil, UDESC<sup>1</sup> Brazil, Udesc<sup>1</sup> Brazil*

Disaster risk reduction plans are crucial for managing the territory of geoparks whose terrains are susceptible to torrential processes, such as flash floods, debris floods and debris flows. The Caminhos dos Cânions do Sul (GCCS) aspiring geopark, located in southern Brazil, covers an escarpment highly susceptible to such processes and its recurrence is evident considering the expressive deposits in the adjacent colluvial-alluvial plain, especially in the form of alluvial fans (Duarte, 1995; Pontelli, 1998) . Investigating the predominant typology of process is a fundamental step to define priority areas for a detailed investigation, especially when these concentrate geosites or their accesses. Therefore, this work aims to evaluate, using the morphometry of basins, the susceptibility to the development of debris flows and flash floods in the Caminhos dos Cânions do Sul Aspiring Geopark (Brazil), since, due to their sudden occurrence and difficult predictability, the flash floods and debris flow are the processes that result in the greatest danger to visitors to the GCCS. For this purpose, 25 drainage basins were delimited, for which 12 morphometric parameters were generated, with the result of the basin's susceptibility compared with the record of mass movements and flash floods occurrences and the location of the geosites. The result of susceptibility to runoff shows 6 basins of Very High Susceptibility, 7 of High, 2 of Medium and 10 of Low, while the classification of basins for susceptibility to debris flow resulted in 5 basins of Very High Susceptibility, 6 of High, 7 Medium and 7 Low. This is a fundamental step in the identification of priority areas for the elaboration of preventive risks and disasters plans, seeking to ensure safe visitation of geosites as well as the integrity of local communities.

**Keywords:** Hydrogeomorphological processes, Aspiring geopark, Disaster risk reduction

**Corresponding author:** mcarolvg@yahoo.com.br

**Reference:**

Duarte, G. M. (1998) Depósitos cenozoicos costeiros e a morfologia do extremo sul de Santa Catarina. Tese de doutorado (Geociências, Universidade de São Paulo. Pontelli, M. E. (2005) Pedomorfoestratigrafia de depósitos de leques aluviais: bacia do Rio Itoupava, sul do Estado de Santa Catarina. Tese de doutorado (Geografia), Programa de Pós-graduação em Geografia, Universidade Federal de Santa Catarina.

## Celebrating The Origins of Animal Life: Building A UNESCO Global Geopark In Charnwood Forest, UK

*Jack MATTHEWS<sup>1\*</sup>,*

*Charnwood Forest aUGGp OUMNH<sup>1</sup> United Kingdom*

Charnwood Forest is host to some of the oldest animal fossils in the world, many of which have been key to developing our understanding of the rise of animals during the Ediacaran period. In addition to its internationally significant palaeontology, the area is also host to a number of working and historic quarries whose lithologies have shaped the built environment of the United Kingdom for more than 2000 years. Charnwood Forest occupies just 10% of the area of Leicestershire, and yet contains more than 50% of the natural protect sites within the county: underlying both the broad geodiversity within the Geopark, and the way this geodiversity has underpinned the extensive biodiversity found here. As such the region provides a natural laboratory for highlighting the often overlooked pivotal role of geodiversity in nature. Following a successful funding application to the National Lottery Heritage Fund, 18 partner organisations led by the National Forest, have resolved to implement programmes to celebrate the areas geoheritage, connect people with their history, and secure a sustainable future. The Charnwood Forest Regional Park, which oversees the project, has decided to develop the programmes within the framework of establishing a UNESCO Global Geopark. This presentation will outline the internationally significant geoheritage, biodiversity, and cultural heritage of Charnwood Forest, and give examples of Geopark development projects already undertaken and also planned, including the our interpretation, conservation, education, and arts programmes. Recognising the key role that UNESCO Global Geoparks play in facilitating international cooperation, Charnwood Forest has made this a priority; even as an Aspiring UNESCO Global Geopark. The presentation will layout our involvement in both IGCP 726 "GEOfood for sustainable development in UNESCO Global Geoparks", and IGCP 714 "3GEO – Geoclimbing & Geotrekking in Geoparks", in addition to our work in developing a pioneering international Sister Geopark partnership agreement. Charnwood Forest Aspiring UNESCO Global Geopark looks forward to further engaging with members of the Global Geopark family, as we further prepare our application and celebrate our unique region.

**Keywords:** Aspiring Geopark, International Cooperation, Palaeontology, Precambrian, Geodiversity

**Corresponding author:** [jmatthews@nationalforest.org](mailto:jmatthews@nationalforest.org)

**Reference:**

---

# DAY 2

December 15

---





## Communicating Geopark heritage and activities to the broad public using social networks. Lesvos island UNESCO Global Geopark as a Case Study

*Nickolas ZOUROS<sup>1</sup>, Dimitrios BLOUKAS<sup>2\*</sup>, Konstantina BENTANA<sup>2</sup>,  
University of the Aegean<sup>1</sup> Greece, Natural History Museum of the Lesvos Petrified Forest<sup>2</sup> Greece,  
Natural History Museum of the Lesvos Petrified Forest<sup>2</sup> Greece*

UNESCO Global Geoparks promote geological heritage protection and promotion and the sustainable local economic development mainly through geotourism. In order to stimulate the geotourism development in the area, it is crucial that a UNESCO Global Geopark has visibility. Visitors as well as local people need to be able to find relevant information on the UNESCO Global Geopark operation and activities. As such, UNESCO Global Geoparks need to create a comprehensive communication strategy in order to communicate and promote their natural and cultural heritage as well as their activities and services. The implementation of such a communication strategy needs the establishment and operation of a professional communication office and the development of a variety of communication tools such as a dedicated website, presence in social media, press releases, publications (leaflets, guides, books). A UNESCO Global Geopark should also have a corporate identity. Lesvos Island UNESCO Global Geopark is located at the Northeast Aegean Sea, Greece and is one of the first recognized Geoparks of the Global Geoparks Network. The Natural History Museum of the Lesvos Petrified Forest is the management body responsible for the operation of the Lesvos island Geopark. The Geopark communication office is responsible for the implementation of the Lesvos Geopark communication strategy. Lesvos Geoparks communication was till recently mainly focusing on print media, TV, radio, and billboard advertising. While those channels are still important, especially during COVID pandemic the importance of digital media and social networks increased. Recognizing that digital communication is crucial to branding Lesvos Geopark, our communication strategy is now well-versed in digital platforms, such as social networks. The Geopark communication office prepares the annual communication plan which includes the main activities and events organized during the year. This annual plan is divided in monthly and weekly communication plans with detailed information on the planned communication actions such as press releases, social media posts, social media campaigns, email newsletters, running banner ads. The implementation of communication plans are accompanied by detailed weekly report on the realization of the communication actions which permits the evaluation of their effectiveness. In this presentation the results of the Lesvos Geopark communication are presented and evaluated.

**Keywords:** Geoparks, Communication, Lesvos island, Social networks

**Corresponding author:** nzour@aegean.gr

**Reference:**

Zouros N. (2004) The European Geoparks Network. Geological heritage protection and local development. Episodes vol 27, No 3, pp 165-171 Martini G, Zouros N, Zhang J, Jin X, Komoo I, Border M, Watanabe M, Frey ML, Rangnes K, Van TT, Melo JPP, Patzak M, Hilario A, Nakada S, Sá AA. UNESCO Global Geoparks in the "World after": a multiple-goals roadmap proposal for future discussion. Episodes -0001;0:-. <https://doi.org/10.18814/epiiugs/2021/021002>

## Lesvos Petrified Forest As A Tool For Climate Education In Lesvos Island UNESCO Global Geopark

*Konstantina BENTANA<sup>1\*</sup>, Nickolas ZOUROS<sup>1</sup>, Ilias VALIAKOS<sup>1</sup>,*

*Natural History Museum of the Lesvos Petrified Forest<sup>1</sup> Greece, Natural History Museum of the Lesvos Petrified Forest<sup>1</sup> Greece, Natural History Museum of the Lesvos Petrified Forest<sup>1</sup> Greece*

The protected area of the Petrified Forest in Lesvos Island UNESCO Global Geopark consists of unique educational geosites. It contains records of the composition of the flora during the Miocene and at the same time it keeps records of the climate change through geological time. The Lesvos Petrified Forest is a particularly effective pedagogical tool to engage school students with climate change through on site exploration. Fossils, geological data and today's plants provide invaluable opportunities to create authentic experiences to school children to understand the consequences of climate change. In the Petrified Forest of Lesvos, students research the climate changes through geological time and learn about its effects on the ecosystems of the Miocene and today's ecosystems. The purpose of this paper is the presentation of the educational program "Climate change: Learning about the consequences by studying the Petrified Forest of Lesvos" and the educational materials that have been designed. Through a variety of educational activities main target of the educational programme is to encourage school students to explore the causes and aspects of climate change, to sensitize them on the effects of climate change, to explore our responsibilities as a society and as individuals and to stimulate them to take action.

**Keywords:** Geopark, Climate, Education, Lesvos Petrified Forest

**Corresponding author:** kon.bentana@gmail.com

**Reference:**

Bentana, K, Zouros, N. (2020). Educational Activities to Enhance Geomorphological Heritage Sites in Lesvos UNESCO Global Geopark. Online Conference "The role of geomorphology in modern society", 16 December 2020, Book of proceedings, 53-57. Bentana, K., Zouros, N., Valiakos, I. (2019). Geoparks and education for the Sustainable Development: Educational Programs in Lesvos Island UNESCO Global Geoparks. 2nd International Conference on the UNESCO Global Geoparks of Greece and Cyprus, Nicosia, Cyprus, 16-18 May 2019, 30-31. Zouros, N., Bentana, K., Valiakos, I., Vasileiadou, K, Thomaidou, E. (2015). Lesvos Geopark Guide. Natural History Museum of the Lesvos Petrified Forest, 168 p. Zouros, N., Valiakos, I. (2015a). New findings in the Petrified Forest of Lesvos Global Geopark: Geoconservation and public awareness, 4th Asia-Pacific Geoparks Network, San'in Kaigan Symposium, Toyooka, p. 22. Zouros, N. (2009). Natural History Museum of the Lesvos Petrified Forest Exhibition Guide. Natural History Museum of the Lesvos Petrified Forest, 156 p.

## Travelling through a pandemic: the GEOclimHOME-PRO exchanges continued during the Covid-19 outbreak

*Ilaria SELVAGGIO<sup>1\*</sup>, Luigi PEROTTI<sup>2</sup>, Patrizia BALZARINI<sup>3</sup>, Mikko KIUTTU<sup>4</sup>, Sophie JUSTICE<sup>5</sup>,  
Sesia Val Grande UNESCO Global Geopark<sup>1</sup> Italy, University of Turin, Earth Sciences Department<sup>2</sup> Italy,  
"Istituto Cobiانchi" High School<sup>3</sup> Italy, Rokua UNESCO Global Geopark<sup>4</sup> Finland, Chablais UNESCO Global Geopark<sup>5</sup> France*

GEOclimHOME-PRO ("Geoheritage and climate change for highlighting the professional perspective") is a 3-year Erasmus+ project (2018-2021) involving secondary schools from three European UNESCO Global Geoparks: Rokua in Finland, Sesia Val Grande in Italy and Chablais in France. The project's aims are: a) to increase the awareness of climate change and b) to improve students' understanding of the active and passive roles of man towards the environment. Based on contents from national school curricula and the international sustainable development goals (SDGs), the educational activities enhanced students' awareness of social responsibility, in order to stimulate their active citizenship and to help discover new job opportunities addressing the local and global needs of sustainable development, future and life-style. A strong point of the project is its educational methodology. The students are deeply engaged through transnational exchanges where they are involved in seminars and practical experiences with researchers. They are mainly working in groups to collect data and to elaborate final talks for sharing results with other students, families, teachers and geoparks educators. This practical approach revealed a weakness of the project during the Covid pandemic: it was either impossible or really hard to travel around Europe and meet people. To address this situation was a great challenge. Project activities were suspended during the 2020 lockdown. Thereafter, different pandemic rules in each country and uncertainty about future restrictions required new "ready for anything" plans: teachers and educators arranged new programmes, including real meetings with school and the local Geopark staff, or virtual meetings between the schools and regions, also organizing a mixed one (both real and virtual activities), opened by a common online conference. Therefore, cooperation between Geopark, school and research institutions within the GEOclimHOME-PRO project provided an unexpected way to directly experience the "resilience" we encourage for facing local and global effects of climate changes.

**Keywords:** education, Geopark, pandemic, climate change, cooperation

**Corresponding author:** selvaggio.ilaria@gmail.com

**Reference:**

Selvaggio I., Perotti L., Balzarini P., Olsbo R. Kiuttu, M. Justice S., Viani C., Giardino M. Travelling through a pandemic the geodimhome-PRO exchanges continued during the Covid-19 outbreak. In: Digital 9th International Conference on UNESCO Global Geoparks, 2021, December 12-16, Jeju Island UNESCO Global Geopark, Republic of Korea.

## Sharing Heritage by Community; The Process of Community-based Documental Movie Making in Kauhajoki

*Marketta NUMMIJÄRVI<sup>1\*</sup>,*

*Lauhanvuori - Hämeen kangas UNESCO Global Geopark<sup>1</sup> Finland*

Kauhajoki is one of the 9 municipalities that has established the Lauhanvuori-Hämeen kangas Unesco Global Geopark in Finland. For many years, there has been a group of active professionals that has voluntarily collected information about local nature, cultural heritage, livelihoods and local history and has formed massive amount of information into easily accessible materials in many forms. The products are printed and digitized popularized publications, Internet pages including many media (kauhajoki.net), 11 5-minute-long videos and at last, a 70-minute-long documental movie. About 200 local amateur and professional volunteers have been involved in the process of composing the materials over years. The compiling product, the movie, was composed of several shorter videos of selected topics. The videos were based on the multi-year-collection of local heritage and information. The topics included extraordinary local geology; the local topography and landscapes; the special geological formation and valuable nominated cultural landscape of Hyypänjokilaakso; up-stream water system and ground water; the diversity of forest and wetland nature; the year cycle of a mire; the special formation of Katikka ravine; the art of farming on the plains and rising highland cattle; the character, urban structure and architecture of the town center. The movie has been presented to over 1000 10-16-year-old school children in Kauhajoki and to many interest groups in private shows. In addition, about 500 people have attended public presentations of the movie. It has widened the understanding and appreciation of local nature and heritage among all age groups, especially among the young children and youth. The local involvement has made the movie-making possible and deepened the experience. These Geopark activities have drawn wide regional attention and will be available permanently to the visitors of the future Geopark Centre that is now under preparation in Kauhajoki.

**Keywords:** Lauhanvuori-Hämeen kangas UNESCO Global Geopark, Kauhajoki, community-based documental movie, local heritage

**Corresponding author:** marketta.nummijarvi@kauhajoki.fi

**Reference:**

Pentti Kakkori, Jussi Kleemola, Marketta Nummijärvi, Tatu Siltanen, Mauri Turunen The Community Heritage Group of Kauhajoki & the Lauhanvuori-Hämeen kangas Geopark Association, South-Ostrobothnia, Finland

## The Island of Biševo: Geoheritage and Coexistence of Humans and Nature

*Tvrtko KORBAR<sup>1\*</sup>,  
Vis Archipelago UNESCO Global Geopark<sup>1</sup> Croatia*

The island of Biševo is the second largest island of the Vis archipelago, which in 2019 became a UNESCO Global Geopark. Biševo geoheritage reflects specific geological history of the central Adriatic. The island is built mainly of stratified Cretaceous to Paleogene carbonate rocks. Over millions of years, these rocks have been forming from subtropical marine life, when large amounts of fossils deposited on the seabed of warm subtropical sea on top of the past Adriatic carbonate platform. Lithification of the carbonate mud and sand during millions of years created layers of carbonate rocks that were raised from the Earth's crust during the Quaternary due to the rise of salt diapirs. Thus, along the shores of the island there are the inclined layers that resemble pages of a stone book, that contains records of geological history from the Age of the Dinosaurs, when the area was connected to Africa, and from the Age of Mammals, when it was closer to Europe. Geologically recently, the stone book was covered with eolian dust, i.e. fine sand deposited by the wind during the last Ice Age, when the most of the present day Adriatic Sea was still a dry steppe. With the rising of the Holocene sea, in combination with the geodynamics of Adriatic microplate (Adria), semi-submerged caves were created. While the Blue Cave is known around the world for its beauty, the mystique of the lesser-known Monk Seal Cave is reinforced by popular geological interpretations of until recently undescribed phenomena, such as the Tectonic Gate and some other specific tectonic features. Modern inhabitants of the islands of Biševo and Vis use these natural resources and try to ensure their survival in coexistence with this geoheritage. With attractive interpretations of still well-preserved but less known inanimate nature and indigenous products grown on a specific geological substrate, the inhabitants plan to attract more visitors through new Visitor Center built on the top of the island, especially pre- and post- of the main summer season. Such a sustainable development of tourism should be the only possible one, in order to continue the successful coexistence of humans and nature on these remote Adriatic islands.

**Keywords:** Vis archipelago UNESCO Global Geopark, Biševo Island, Stone Book, Blue Cave, sustainable tourism

**Corresponding author:** tkorbar@hgi-cgs.hr

**Reference:**

<https://geopark-vis.com/>

## The Digitization Of Cultural Heritage In The Idrija Geopark

*Maša ČIBEJ<sup>1</sup>\*,*  
*Idrija Tourism Board<sup>1</sup> Slovenia*

The Idrija UNESCO Global Geopark boasts an extraordinary cultural heritage originating in the town's mercury mining past and now included in the UNESCO World Heritage List. It reflects Idrija's identity, knowledge, and tradition, and forms the basis of the town's tourism. The principal institutions tasked with the preservation, maintenance, and marketing of the Idrija Geopark cultural heritage are the Idrija Municipal Museum and the Idrija Centre for the Management of Mercury Heritage. The Idrija Geopark cooperates with both institutions to carry out activities for the development of innovative and sustainable tourism products to improve the visibility, awareness, and attractiveness of Idrija's heritage. In the past two years, with funding from the European Regional Development Fund for digital innovations of cultural heritage in leading destinations, we joined forces to develop digitization solutions to make cultural heritage more accessible to modern visitors and contribute to its intellectual accessibility. The lead partner was the Sora Development Agency from the nearby town of Škofja Loka, which forms a single leading destination together with Idrija. The digitized objects from the Idrija region are the kamšt (a wooden wheel used to pump water from the mine) and a rotary furnace (once used to smelt mercury ore). In the past, both objects were significant technological innovations in mercury mining. Today, however, they are difficult to present, as to show their performance live is practically impossible. To remedy this, we collaborated with one of the leading Slovene IT-companies to design 3D models of the kamšt and the rotary furnace with animations of their performance. The models will be available for observation with AR and VR technologies. The use of advanced technological solutions and focus on preserving authenticity have allowed for a digitally enriched experience of immovable cultural heritage that will offer visitors a modern and interactive opportunity to observe Idrija's monuments in a more fascinating, recognizable, and accessible light. The 3D models can also be further used as data for other purposes such as education, monument restoration, and tourism. Cooperation among institutions was a key factor in the success of the project. Only the financial support and the expert contribution of abovementioned heritage-focused institutions, the coordination of the Idrija Tourism Board, the knowledge of the IT-company, and the funding provided by the ERDF and the Municipality of Idrija allowed for the creation of digital solutions that represent a significant contribution to the preservation, presentation, and promotion of cultural heritage. The collaboration fosters the preservation of cultural values, offers new opportunities for their presentation for tourists, experts, and educators, and enhances the digital and hybrid competences of the involved parties.

**Keywords:** digitization, cultural heritage, sustainable tourism, participant collaboration, Idrija Geopark

**Corresponding author:** masa.cibej@geopark-idrija.si

**Reference:**

Straus, M., Starc Peceny, U., Ilijaš, T. (2019). Digitalno inoviranje kulturne dediščine: priročnik za turistične destinacije, <https://tourism4-0.org/wp-content/uploads/2020/01/Priro%C4%8Dnik-Heritage-web.pdf>, accessed 12 November 2021. Nova Gorica: Arctur d.o.o.

## Integrated Management of Multi-designations in Huangshan

Runze CHEN<sup>1\*</sup>, Wei LI<sup>1</sup>,

*Huangshan Geopark Administrative Committee<sup>1</sup> China, Huangshan Geopark Administrative Committee<sup>1</sup> China*

As a scenic area since ancient time, Huangshan's management has evolved for a long time. Until 1982, Huangshan became a national scenic area of China and the tourism industry here is taken seriously. Since then, for promotion, communication and to learn cutting-edge protection concept and method, Huangshan has successfully applied for the three UNESCO designations, the World Heritage, UNESCO Global Geopark and Biosphere Reserve. At the new development stage, we found that it is essential to make a strategy for integrated management of these designations to save cost and energy and to make our work more smoothly. The Huangshan Dialogue Conference further push us to think about this issue. For the synergy of multi-designations, we have introduced the standard of IUCN Green List, a holistic management tool for protected areas, education activities are done for surrounding communities, local school, universities and our staff to make them better understand with Huangshan's value and designations, so that to gain good support of them. Besides, we made our website of Huangshan UGGp into a website for Huangshan UNESCO designated site. Interdisciplinary researches are carried out with top universities in China to find the links between these designations in a microscopic approach, to search something in common and to give people a concept that everything is connected and so it is reasonable to management heritages, geosites and bios in a holistic way. In addition, a project especially for integrated management is undergoing, with the support of China University of Geoscience (Wuhan). And together with Shennongjia UGGp in China, Cilento UGGp of Italy and Azoure UGGp in Portugal, we initiate the Forum for UNESCO Multi-designations Sites to exchange and help each other. Through all these activities, we hope we can find a suitable way for Huangshan's integrated management and maybe provide some inspiration for others.

**Keywords:** Huangshan, Multi-designations, integrated management

**Corresponding author:** chinahsgeopark@163.com

**Reference:**

## Synergetic Management of Multiple International Designations of Shennongjia

Jinxin CHEN<sup>1\*</sup>,

*Administration of Shennongjia National Park<sup>1</sup> China*

Shennongjia is China's only area with four international designations, i.e. UNESCO World Biosphere Reserve, UNESCO Global Geopark, UNESCO World Heritage natural site and Ramsar site (Wetland of International Importance). These international designations have promoted Shennongjia's reputation, attracted more visitors, and helped Shennongjia realize comprehensive conservation of its natural heritage. But they also have brought some challenges in terms of synergetic management, control of visitors flow, improvement of management capability, transdisciplinary science research & education, inter-regional coordination, etc. Since Shennongjia became one of the pilot areas of China's national park system in 2016, measures have been taken to achieve unified, synegetic and efficient management of its domestic and international designations, such as unifying management organizations, integrating various protected areas, compiling comprehensive plans, management zoning, legislation, establishing an advisory committee, reinforce law enforcement, building an information-based monitoring system, constructing wildlife passages, control of visitors flow, building a platform for cooperative science research, building popular science education bases, encouraging community involvement, support local economy, establishing an eco-compensation mechanism, building characteristic towns, establishing an alliance of neighboring protected areas and etc. This poster briefly introduces these measures so other places with multiple international designations can use Shennongjia's experience for reference.

**Keywords:** synergetic management, multiple international designations, UNESCO Global Geopark, Shennongjia

**Corresponding author:** snjdzgy@163.com

**Reference:**

1. Master Plan of Shennongjia National Park
2. Community Development Plan of Shennongjia National Park

## Comprehensive Management In Territories Hosting Multiple UNESCO Designations: A Case From Yanqing UNESCO Global Geopark

*Junbo WANG<sup>1\*</sup>, Nickolas ZOUROS<sup>1</sup>,*

*University of the Aegean<sup>1</sup> China, University of the Aegean<sup>1</sup> Greece*

The number of natural areas hosting multiple UNESCO designations (Natural World Heritage Sites, Man and Biosphere Reserves, UNESCO Global Geoparks) increased in recent years and several proposals have been made to improve their management by taking into consideration the co-existence of different brands. In this paper the results of the establishment of a new management structure aiming the comprehensive management of the Yanqing UNESCO Global Geopark which includes the Badaling Great Wall World Heritage Site is examined. The new overall management body is responsible for both UNESCO designations and its new comprehensive management plan demonstrates the highest standards and quality of practice of the territorial natural and cultural heritage management. Implementing the holistic concept in territorial heritage management, Yanqing UNESCO Global Geopark, installs interpretation panels to explain the relation between the geological conditions and the foundation of the cultural monument and creates geo-trails along the Great Wall. A permanent thematic Geopark exhibition is established in the Great Wall Museum presenting the connection between the geology of the granitic hills and the Badaling Great Wall World Heritage Site on these hills. Additionally, the logos and significance of each international designation are explained on site. The installation of both designation's logos along the Badaling Great Wall successfully translate the site's values to educate visitors and support the development of sustainable tourism. Thus, Badaling Great Wall acts as a lighthouse to attract the interest of visitors for the exceptional geological and cultural heritage of the Yanqing UNESCO Global Geopark. The activities implemented are focusing in visitor management in a sustainable way as well as in scientific popularization education for visitors. As a result, the growth of the number of visitors and income at the Badaling Great Wall site has been achieved. The positive results of the co-management of a UNESCO Global Geopark and a World Heritage site might contribute to form a new management to those Geoparks which host multiple UNESCO designations providing a new model to achieve the targets of the effective heritage conservation and management as well as the sustainable development of their territory.

**Keywords:** UNESCO Global Geopark, World Heritage site, multiple UNESCO designations, co-management

**Corresponding author:** geod18008@geo.aegean.gr

**Reference:**

Zouros, N., 2004. The European Geopark Network Geological heritage protection and local development[J]. *Episodes*, 27(3): 165-171.  
Zouros, N., 2006. The European Geoparks Network: Geological heritage protection and local development [J]. *Episodes*, 2006, 27(3): 165-171.  
Zouros, N., 2013. European geoparks: new challenges and innovative tools towards earth heritage management and sustainable local development. *Proceedings of 12th European Geoparks Conference*, 2013.  
Zouros, N., 2016. Global geoparks network and UNESCO's new global geoparks programme[J]. *Newsletter of the Geological Society of Greece*, 50 (1) (2016), pp. 284-292.

## UNESCO multi-designations integrated management plan - National Park of Cilento vallo di Diano and Alburni UGGp

*Aniello ALOIA<sup>1\*</sup>,*

*National Park of Cilento vallo di Diano and Alburni UGGp<sup>1</sup> Italy*

The Cilento, Vallo di Diano and Alburni National Park arises from the combined relationship between nature and men: an "evolutionary landscape" resulted from the combination of environmental, geological, landscape, historical, social, cultural, economic, artistic, and spiritual elements. It is one of the few sites awarded four UNESCO recognitions worldwide. - In 1997, the Cilento and Vallo di Diano National Park was designated Biosphere Reserve within the UNESCO Man and Biosphere Programme (MaB). Biosphere Reserves are part of the scientific programme Man and the Biosphere, as they promote scientific and interdisciplinary research, and sustainable development through the engagement of local communities. - In 1998, the National Park was inscribed in the UNESCO World Heritage list, as a cultural landscape featuring sites of historical, cultural, and artistic relevance such as: the Certosa di Padula (the biggest monastic structure of Italy and one of the most interesting across Europe), Velia (an archaeological area which preserves the monumental remains of a Ionic temple, a theatre dating back to the III century b.C., and the Adrian's thermal baths), and Paestum, an archaeological area featuring Doric temples. - In 2010, the Cilento, Vallo di Diano and Alburni National Park was designated UNESCO Geopark for the relevant geological heritage of this area and its deep connections to the cultural heritage. - Again, in 2010, the Mediterranean Diet was inscribed in the UNESCO Representative List of the Intangible Cultural Heritage of Humanity, as it embeds traditions, uses, symbols and knowledge on agriculture, cuisine, fishing, food storage and sharing techniques that underline the values of hospitality, creativity, and intercultural dialogue. The decision to draw up an Integrated Management Plan for the four UNESCO recognitions of Cilento, Vallo di Diano and Alburni, stems from the knowledge of the reality, of the territory and of the local communities; it refers to the UNESCO guidelines on the role of its programmes and recognitions for the pursuit of sustainable development. The Integrated Management Plan is a necessity rather than an actual decision. An integrated management not only provides for compliance with the UNESCO guidelines within the areas awarded with different recognitions, but it also promotes the implementation of simpler measures and the positive connection among public and private stakeholders in charge of managing the sites (cultural, geological, and natural sites) which mostly reflect the values recognised by UNESCO. Although the Cilento, Vallo di Diano and Alburni Park acts as a qualified and structured managing authority of the UNESCO recognitions, an extended governance model is required to ensure that the complex issues of the area are effectively managed.

**Keywords:** multidesignation, National Park, Integrated management plane

**Corresponding author:** a.aloia@cilentoediano.it

**Reference:**

## Geological World Heritage

- a revised global framework for the application of criterion (viii) of the World Heritage Convention and a comparison with UNESCO Global Geoparks

*Patrick MC KEEVER<sup>1\*</sup>, Guy NARBONNE<sup>2</sup>,  
GGN<sup>1</sup> Ireland, Queen's University at Kingston<sup>2</sup> Canada*

In 2005, IUCN published a report entitled *Geological World Heritage: A Global Framework* (Dingwall et al., 2005). The aim of that report was to discuss and advise on the role of the World Heritage Convention in recognising and protecting geological and geomorphological heritage. The report identified 13 themes and, since its publication, an additional 22 geological and geomorphological properties have been inscribed on the World Heritage List under criterion (viii). Furthermore, in 2015, UNESCO adopted the new International Geoscience and Geoparks Programme (IGGP), which recognises a new site-level designation, the UNESCO Global Geopark as territories of internationally significant geological heritage. As of June 2021, there are 169 UNESCO Global Geoparks in 44 countries. In 2019, IUCN at the request of the World Heritage Committee commissioned the authors, aided by a global group of experts, to fully revise and update the 2005 report and to look at the potential impact of the new UNESCO Global Geopark designation on future inscriptions to the World Heritage List under criterion (viii). Central to this task is a discussion on the concept of Outstanding Universal Value, and reiteration that not all sites of significance can be included on the World Heritage List. This aim of the report has been achieved through a thorough review of the 2005 report, and in particular the thematic approach to geology that the report used. Published in 2021, the new report (Mc Keever, P.J. and Narbonne, G.M., 2021) has led to the proposal of a rationalised set of 11 themes to guide the application of criterion (viii). Finally, the new report looks in detail at the differences and similarities between geological World Heritage Properties recognised under criterion (viii) and UNESCO Global Geoparks. It examines each designation and presents a pathway to help States Parties / Member States to determine whether one of these two UNESCO designations might be appropriate for any possible new territories, and in particular to distinguish sites with the potential for inscription on the World Heritage List. This presentation summarises the key findings of the study.

**Keywords:** Geological World Heritage, UNESCO Global Geoparks, Revised Global Framework

**Corresponding author:** patrickgsni@yahoo.ie

**Reference:**

Dingwall, P., Weighell, T. and Badman, T. (2005). *Geological World Heritage: A Global Framework*. Gland, Switzerland: IUCN. Mc Keever, P.J. and Narbonne, G.M. (2021). *Geological World Heritage: a revised global framework for the application of criterion (viii) of the World Heritage Convention*. Gland, Switzerland: IUCN.

## Review of the 10th Anniversary of Tianzhushan UNESCO Global Geopark

Wen HUANG<sup>1\*</sup>,

Tianzhushan UNESCO Global Geopark<sup>1</sup> China

The year 2021 marks the 10th anniversary of Tianzhushan UNESCO Global Geopark, since it joined GGN in 2011. In the past ten years, under the guidance of UNESCO, GGN, National Forestry and Grassland Administration, with great support of scientific research institutions, universities, relative departments and especially local communities, Tianzhushan UNESCO Global Geopark has actively implemented the new development concept of “innovation, coordination, green, openness and sharing” to protect the nature, serve the people and achieve sustainable development. First of all, the park has made systematic public interpretation system, including geo-heritage explanation boards, road signs, guide maps, direction signs and security signs, science popularization galleries; The park has speed up the construction of study-tour bases, including Tianzhushan Geopark Museum and a Forest Education Base under Sino-Germany Cooperation. Second, geo-heritages within Tianzhushan Geopark are well protected through laws and regulations: Provisions on the Protection and Administration of Geological Relics, Regulations on Tianzhushan Tourist Attraction in Anqing City, Tianzhushan National Geopark Planning and Tianzhushan UNESCO Global Geopark Management Planning. The park has carried out geo-heritage conservation projects, including boundaries, monitoring system, interpretation system, Paleocene mammalian fossils conservation project and biodiversity conservation project, and regularly patrolled geosites to prevent damage. Third, cooperating with scientific research institutions and universities, the park has made fruitful scientific researches. The park has compiled Tianzhushan UNESCO Global Geopark Planning, rehabilitated 52 fossils, draw restoration pictures of 9 typical fossils and made solid restoration models, held domestic and international meetings on paleontological fossils, ultrahigh pressure metamorphic belt and magmatic rocks, released many scientific research publications, including Researches on Tianzhushan Granite Landform, Butterflies, Animal and Plant Resources in Tianzhushan and latest discoveries of new geo-heritages; Fourth, the park has often carried out science popularization activities in schools, communities with different themes: geology, nature education and culture. These colorful activities were carried out in the forms of popular science lectures, drawing competitions, essay competitions, exhibitions and nature experiencing, etc. The park also has held many thematic activities on World Earth Day, World Environment Day, National Science Popularization Week, World Mountain Day, etc. Fifth, the park actively participate UNESCO Global Geoparks networking, including attending global conferences, APGN symposiums, annual meetings, common exhibitions, establishing sister geoparks and other different activities. All of these have stimulate the geo-tour development, brought benefits to local communities.

**Keywords:** Review, Tianzhushan UNESCO Global Geopark, 10th Anniversary, Protection, Science popularization

**Corresponding author:** tzsgeopark@126.com

**Reference:**

Tianzhushan UGGp work report

## Discussion On The Value Of Monogenetic Volcanic Area Under Unique Intracontinental Tectonic Background Of Wudalianchi UGGp

Jiabo ZHANG<sup>1\*</sup>,

Wudalianchi Administration Committee<sup>1</sup> China

Wudalianchi UNESCO Global Geopark, with a total area of 790.11 square kilometers, is located in the north central region of Heilongjiang Province. It was designated as a global geopark in 2004. The volcanic area of Wudalianchi showcases a type of volcanic system known as an intra-continental monogenetic volcanic field. The volcanic field is of great scientific interest because it is located on continental crust, a very long distance from any tectonic plate boundary. The field does not contain any large polygenetic volcano, but instead comprises 14 dispersed volcanoes developed from separate, relatively short-lived, eruptive episodes. The field has a systematic growth pattern, which suggests that it represents a single magmatic system in the same way that long-lived central volcanoes do, except that monogenetic volcanic fields grow laterally, rather than vertically. In such a volcanic system, the supply rate of magma is so spread out temporally and spatially that no preferred plumbing is ever established: i.e., the next batch of magma does not have a pre-existing pathway to the surface and makes its own. The Park is celebrated nationally and internationally for its abundant well-developed volcanic features and its accessibility for public viewing and recreation. The activity has consistently erupted a K-rich basaltic magma (phonolite), which because of its unusual chemical properties has been given the local name Shilongite. Each eruption built shield-like lava domes or plateaus, the 14 largest being surmounted by impressive scoria and tephra cones. The last significant period of activity, from Laoheishan and Huoshoashan, between 1719-21, erupted large quantities of lava, known as the New Period Lava, which formed a plateau of c.70 km<sup>2</sup> in the centre of the nominated property, and blocked the north-south flowing Shilong River in four places to form the string of 5 lakes - known as Wudalianchi. Wudalianchi is an area of volcanic terrain and active volcanism over which has developed a most remarkable ecology. The site is especially significant as an international example of an active monogenetic volcanic field located within a continental lithospheric plate, far from any plate boundary. It has further importance as one of a very few places in the world where it is possible to research ongoing processes of species adaptation, and the development of biotic communities from the mixing of species from different ecoregions, and as a result of repeated phases of partial vegetation destruction and reassembly, or more strictly, "re-evolution".

**Keywords:** Wudalianchi, Geopark, intra-continental monogenetic volcanic field, ecoregions

**Corresponding author:** wdlc.zoe@163.com

**Reference:**

Wudalianchi Documents

## Measures implemented for containing the spread of COVID-19 in Zhangjiajie UGGp of China and the adjacent areas

*Yiheng ZHOU<sup>1</sup>, He-qing HUANG<sup>2\*</sup>, Hanke LIU<sup>1</sup>,  
Administrative Office of Zhangjiajie UGGp<sup>1</sup> China, Chinese Academy of Sciences<sup>2</sup> China,  
Administrative Office of Zhangjiajie UGGp<sup>1</sup> China*

Zhangjiajie UGGp is a part of Zhangjiajie City located in the western Hunan province of China and as a top-listed tourism destination in China, attracts more than 6 million tourists each year. Since May 2021, tourism in Zhangjiajie UGGp had gone back to normal gradually. Nevertheless, a notice came in the afternoon of July 26 that there were 3 tourists confirmed infection at the other place and yet linked to a theatrical performance at Zhangjiajie UGGp during July 17-23. Immediately, all of the measures were taken to fight the virus and Zhangjiajie City closed all its tourist sites including the geopark on July 30 after reporting one confirmed locally transmitted case of COVID-19 the day before. Until August 16, the entire city identified a total of 77 infection cases (72 confirmed cases and 5 asymptomatic cases) and has not reported a confirmed infection since then. Since August 27, the core scenic spots in Zhangjiajie UGGp were reopened to the public and tourists are welcomed by cutting entrance fees and shuttle bus fares by half at the spots for a month, while implementing strict epidemic control methods. The spread of the highly contagious Delta variant of COVID-19 in Zhangjiajie City had been curbed swiftly mainly owing to the implementation of effective measures and restrictions, including: (1) Authorities quickly clamped down on local flare-ups with measures like mass nucleic acid testing and targeted lockdowns, which led to a quick and distinct downward trend in new infections while minimizing the impact on people's daily lives; (2) Medics, disease control and prevention workers, police officers, community workers, and volunteers in the area and beyond went all out in the frontlines to battle the virus; (3) People-centered approaches had been implemented, such as organizing experts in traditional Chinese medicine to develop customized treatment programs respectively for severe cases, moderate cases, mild ones, and asymptomatic carriers, providing free accommodation and food for stranded visitors and arranged medical staff to conduct nucleic acid tests for tourists at hotels, and deploying a rapid response mechanism and relief measures for socially disadvantaged groups and people in difficulties, especially persons with disabilities and children.

**Keywords:** Zhangjiajie UGGp, COVID-19, Virus Fighting, People-centered Approaches, Tourism

**Corresponding author:** 349071923@qq.com

**Reference:**

## New Research Activities using Marine Plastic Debris on the Coastal Geosites, the Nanki Kumano Geopark, Japan

Yutaka OKAZAKI<sup>1</sup>, Wataru AZUMA<sup>2\*</sup>,

Wakayama University, Japan<sup>1</sup> Japan, The Wakayama Prefectural Nanki Kumano Geopark Center, Japan<sup>2</sup> Japan

Marine plastic debris is now a major concern worldwide. In many geoparks around the world where geosites are set up on the coast, the issue of how to deal with marine plastics is a big challenge from the viewpoint of coastal conservation as well as education for sustainable development. Therefore, as one of the geopark activity, we have started a brand-new program to study marine plastic on the beach as one of the "research activities", not just a "cleaning-up activity". The research activities were carried out on the Shihara coast (Shirahama Town, Wakayama Prefecture), located on the western side of the Kii Peninsula, the upstream side of the Kuroshio Current, and the Miwasaki coast (Shingu City, Wakayama Prefecture), located on the eastern side of the Kii Peninsula, Japan. These two coasts are a gravel beach, adjacent to uplift of the Kii Peninsula, and are subjected under strong agitation by high energy waves from typhoons and storms. As the result, when the drifting plastic debris arrives at the coast, the debris could be quickly shattered by the waves. On the beach, we counted and weighed the wastes like PET bottles, plastic food packages, fishing materials, etc. Also, we recognized the characters printed on the debris (Japanese, Chinese, English, etc.) to estimate the origin of these litters. Most of the debris were local and was not transported over long distances by the Kuroshio Current, probably because the Kuroshio was currently meandering offshore. In this trial, we try to establish standard method to clarify and quantify the classification categories of the anthropogenic marine litters. By comparing and examining the characteristics of the beach anthropogenic litters, especially plastic debris, among the different locations and seasons, we will enable to recognize the status of the beach marine plastics debris for the conservation of the coastal geosite. For that reason, what we should now is to unify the classification criteria as well as the research methods, that can be called as geopark standard. Our example will provide the basis of "geopark standard".

**Keywords:** marine plastics, geosite, gravel beach, Nanki Kumano Geopark

**Corresponding author:** yutakaok@wakayama-u.ac.jp

**Reference:**

<https://nankikumanogeo.jp>

## Geo Art: Let's Make Stone Faces

*Takahiko OGAWARA<sup>1\*</sup>, Theodore BROWN<sup>1</sup>, Takeo KOBAYASHI<sup>1</sup>, Toshihiro UCHIYAMA<sup>2</sup>, Ryuji MATSUZAWA<sup>2</sup>, Itoigawa City Geopark Promotion Office<sup>1</sup> Japan, Itoigawa City Geopark Promotion Office<sup>1</sup> Japan, Itoigawa City Geopark Promotion Office<sup>1</sup> Japan, Itoigawa City Planning and Settlement Division<sup>2</sup> Japan, Itoigawa City Planning and Settlement Division<sup>2</sup> Japan*

Itoigawa UNESCO Global Geopark was one of the first areas in Japan to be recognized as a Global Geopark in 2009. The jade produced in Itoigawa Geopark has been used since the Jomon period (about 5,000 years ago) as Japan's representative gemstone, and is recognized as the National Stone of Japan. Jade can be found on Itoigawa's coasts, and visitors enjoy searching for stones along the sea.

The Itoigawa-Shizuoka Tectonic Line, which geologically divides the Japanese Archipelago and runs through the Itoigawa Geopark, has rocks of old age (granite, jade, serpentinite, limestone, chert, etc.) on the west side and rocks of new age (rhyolite, andesite, sandstone, mudstone, etc.) on the east side. As a result, there are over 50 types of rock on the coast, making it one of the most diverse in Japan.

Since 2018, Itoigawa Geopark has engaged in a promotional campaign that emphasizes the many rocks of Itoigawa. In 2021, the Geopark started a program for visitors and schools linking stones and art by arranging different stones gathered from Itoigawa's coasts to create "Stone Faces." This activity were carried out to achieve the following objectives: (i) to increase the number of people familiar with stones through stone art; (ii) to increase interest in stones other than jade and to understand the geological processes that have formed the Japanese Archipelago and our planet; (iii) and to learn about the preciousness of stones and use this as an opportunity to create a sustainable society.

At Itoigawa's Fossa Magna Museum, visitors can make these Stone Faces at a provided table and photographs of these faces can be submitted to an ongoing social media campaign via Instagram and Twitter.

**Keywords:** Itoigawa UNESCO Global Geopark, city promotion, mineral diversity, geo art

**Corresponding author:** [geopark@city.itoigawa.lg.jp](mailto:geopark@city.itoigawa.lg.jp)

**Reference:**

## The (E)Valuation of Geosites in the UNESCO Global Geopark TERRA.vita

Tobias FISCHER<sup>1\*</sup>,

UNESCO Global Geopark TERRA.vita<sup>1</sup> Germany

What is the geoscientific significance of the UNESCO Global Geopark TERRA.vita? How valuable are individual landscape elements in the area? Which geosites should receive more attention due to their geoscientific importance and aesthetics? The Geopark team asked itself these critical questions as part of a self-evaluation. The goal of this study is not only to highlight geological unique characteristics, but also to improve the protection of geological heritage and the geosite management as well as to create new starting points for environmental education and geotourism. First, the geosites were re-mapped and entered into a digital geosite database. For this purpose, the geosites were described in detailed and standardized entry sheets. In a second step, the geosites were assessed with regard to their geodiversity, importance in geoscience, condition and protection status, and their potential for environmental education and geotourism. To evaluate the geosites, a point-based scoring system was developed. The structure of the entry sheets and the rating system are based on a guidelines study for geosite protection by Germany's federal state geological surveys ("Arbeitsanleitung Geotopschutz in Deutschland", Staatliche Geologische Dienste der Länder 2018). The evaluation of the geosites was published in the book "Wertgebende Landschaften und Landschaftselemente im Natur- und UNESCO Geopark TERRA.vita" (Fischer 2020; ISBN: 978-3-945096-09-3). The English version is currently in preparation and is scheduled to be published in March 2022. In this publication, the 162 most important geosites in the Geopark area are presented and geoscientifically described. Based on the scoring system, recommendations for geosite maintenance and establishment of geotourism for the most interesting geosites were made for each county in the Geopark area. In total, 439 geosites are listed in the database of which 336 geosites can be described as geological objects (cliffs, quarries, larger outcrops, ...). Another 55 geological objects have an archaeological background (megalithic tombs, tumuli fields, Varus Battle excavation site, ...), 43 objects are geohistoric (e.g., tunnels), and five objects have a historico-cultural background (e.g., plaggen soil fields). 15% of the geosites are already signposted and easily accessible for geotourists. However, another 46% are considered as interesting for a prospective improvement for geotourism. 21 geosites were classified as internationally significant for the geosciences. 12% of the geosites recorded in the database are of national or greater importance and underline the value of the UNESCO Global Geopark TERRA.vita.

**Keywords:** Geosites, Geopark, Geoheritage, Geotourism

**Corresponding author:** tobias.fischer@Lkos.de

**Reference:**

Fischer, T., 2020. Wertgebende Landschaften und Landschaftselemente im Natur- und UNESCO Geopark TERRA.vita. Natur- und Geopark TERRA.vita (Ed.). Osnabrück, 195 pp. [in German]. Staatliche Geologische Dienste der Länder, 2018. Arbeitsanleitung Geotopschutz in Deutschland. Leitfaden der Geologischen Dienste der Länder der Bundesrepublik Deutschland. Jena, 2nd edition, 136 pp. [in German].

## Rebranding A Mature Geopark – From Marble Arch Caves To Cuilcagh Lakelands - A Collaborative Approach

*Gráinne O CONNOR<sup>1\*</sup>,*

*Cuilcagh Lakelands UNESCO Global Geopark<sup>1</sup> Ireland*

The Marble Arch Caves and Cuilcagh Mountain were jointly recognised as the first European Geopark in the UK in 2001 and later in 2004 under the creation of the Global Geopark Network as Marble Arch Caves Global Geopark. This year the Geopark celebrated its 20th anniversary in a period of significant transition which included a complete restructuring and rebranding as recommended under a governance review for the Geopark, initiated in 2018. This process resulted in the restructuring and expansion of the Geopark team as well as a new brand and new name proposal. Cuilcagh Lakelands UNESCO Global Geopark, as it is now known, was born from an exhaustive and collaborative process of engagement with local communities, stakeholders and governing authorities. This holistic independently led process was driven by the clear desire of relevant stakeholders and imperatively local communities in proposing a new name which would better represent the area that the Geopark had grown into over a twenty-year period. The Marble Arch Caves UNESCO Global Geopark, whilst established in 2001 has evolved significantly over this twenty-year period from encompassing 1,400 hectares in 2004 to 18,000 hectares in 2007. Perhaps one of the most significant developments resulted from the Geopark crossing international boundaries into the Republic of Ireland in 2008 to become the world's first transnational Geopark. This further expansion resulted in a Geopark which encompassed an area in excess of 2,333 km<sup>2</sup> representing a myriad of communities, landscapes and cultures whilst governed under two different jurisdictions. Whilst overwhelming positive this did present challenges. What was apparent, as the Geopark evolved, was that the name did not now fit the vast region which it represented and thus this consultative process began examining how communities, businesses, visitors and stakeholders could better identify with the name and in turn have a greater affiliation to the landscape and designation in which they live, visit and operate. In doing so there was a distinct acknowledgement of the work that has gone before in establishing the Marble Arch Caves UNESCO Global Geopark within the network, amongst local communities and various stakeholders. The Marble Arch Caves Visitor Centre continues to operate as an integral Geosite within the Geopark and is central to the overall offering. It will undoubtedly take time for this rebrand to be embedded in collective consciousness. Thus an accompanying communications plan and brand guidelines document have been devised. Extensive market segmentation research and the creation of a new ten year development plan have also complimented this process. All this has resulted in a renewed stewardship and accountability by those individuals, groups and communities towards a more holistic and sustainable UNESCO Global Geopark, something which benefits the landscape and everyone who lives and experiences it.

**Keywords:** Mature Geopark, Marble Arch Caves UNESCO Global Geopark, Cuilcagh Lakelands UNESCO Global Geopark, Rebrand, Engagement

**Corresponding author:** goconnor@cavancoco.ie

**Reference:**

BTS, 2019, Marble Arch Caves UNESCO Global Geopark - Governance, Management and Development

## AUGGN new structure to promote the geopark concept in Africa

*Driss ACHBAL<sup>1\*</sup>,  
UGGP of Mgoun<sup>1</sup> Morocco*

Currently, there are 169 UNESCO Global Geoparks in 44 countries around the world. And today there are just two UNESCO Global Geoparks in Africa, that's mean that the concept of the Geopark is not yet developed in Africa and the Arab States. In this context, the M'Goun Geopark in Morocco and the Ngorongoro Lengay Geopark in Tanzania create the Regional Network of Africa : African UNESCO Global Geopark Network (AUGGN) in November 2019 in Morocco. This network is providing a platform for collaboration to facilitate the implementation of new Geoparks and improve geoheritage governance in the Africa and in all unified geographical areas where sites and landscapes of international geological significance are managed with a holistic concept of protection, education, and sustainable development. The main objective of AUGGN is supporting the aspiring Geoparks Projects in Africa and promote the Global Geopark concept in Africa and facilitate the experiences sharing of the M'Goun Geopark in Morocco and the Ngongoro Geopark in Tanzania, also mobilizing the governments to apply the concept of Geopark for a real lever of a sustainable territorial development in the Arab and African countries. The AUGGN is the new structure to promote the Geopark concept in Africa and Provide the necessary documents to apply to the GGN and offer the Training on the UNESCO labeling process, also is offering a personalized assistance to up to the aspiring Geoparks on the continent. And providing a preliminary plan for development of a Geopark.

**Keywords:** AUGGN, Aspiring geopark, development, culture and heritage, Africa

**Corresponding author:** dgs.rbk@gmail.com

**Reference:**

- GGN studies - Scientific articles - Regional networks studies

## The Larvikite: A Unique Rock – Perfect For Communication But At The Same Time A Huge Industry Inside Gea Norvegica UGGp

*Kristin RANGNES<sup>1\*</sup>,  
EGN Coordinator GGN Treasurer<sup>1</sup> Norway*

A Permian Rift Valley constitutes the Eastern part of Gea Norvegica UNESCO Global Geopark. This part of the Oslo Rift (Norway) is well known among geologist - for rare magmatic rocks and numerous rare minerals. It is also the area where the element Thorium was discovered for the first time. The most famous and special rock is the blue Larvikite, a really unique rock as the only known occurrence worldwide is in the Oslo Rift. The Larvikite can at the closest be classified as a monzonite, with a special twinning between plagioclase and K-feldspar. This microscopic twinning is giving rise to the shiny blue crystals that is the trademark of the Larvikite. Due to the blue color the rock is a popular dimension rock, for building industry to artwork. Hence it is object to extensive legal quarrying and export. Larvikite occurs in different varieties, from rusty red in the east part to bluish grey and blue in a western direction. The youngest Larvikite is a grey nepheline bearing variety. For our geopark the Larvikite is one of our internationally significant geological heritage and it is widespread in the Eastern half of our Geopark. We are using different aspect of the Larvikite in our communication, as how it is sculptured by ice during Quaternary, how it is contributing to rich soils, giving a special landscape or can demonstrate complicated conditions deep down in a magma chamber. But also, it is of interest how our UNESCO Global Geopark manage to work together with the industry and are able to use the quarries in an educational way.

**Keywords:** Larvikite, Permian Oslo Rift, National Rock of Norway, Quarrying, education and geotourism

**Corresponding author:** kristin.rangnes@geanor.no

**Reference:**

Rangnes, K. 2021 The Larvikite: A Unique Rock – Perfect For Communication But At The Same Time A Huge Industry In Gea Norvegica UGGp. DIGITAL 9th International Conference on UNESCO global geoparks.

## Geologist And Scientist For A Day: An Educational Program During The Pandemic

*Vegard LUND<sup>1\*</sup>,*

*Gea Norvegica UNESCO Global Geopark<sup>1</sup> Norway*

In this presentation I will talk about how the pandemic changed our plans for educational projects with school classes, and present one of the projects we created and carried out during this period. Due to strict regulations on the schools, we needed a new approach to communicate with the pupils inside our geopark. The biggest obstacles were to make a program where we could maintain the social distancing rules without compromising the quality of learning. The schools were skeptical bringing outsiders into the classrooms and transporting the pupils on busses, so the program had to be well planned and fit the needs of the schools. We chose to make the program for 8th graders, because they had recently started in upper secondary school, where large parts of their teaching had taken place digitally. We therefore saw this as a good opportunity to use the project to create more unity within the classes. To have the manpower to create and implement a program of this magnitude, we teamed up with the local science center, where they have very competent educators working. Together we put together the framework for the program and contacted the schools. We called the program “geologist and scientist for a day”, where the fundamental idea was to use the schoolyard as a place to do fieldwork, and sample both geological and biological material to later be studied in the laboratory. We wanted to make the field and lab work as authentic as possible and chose sampling methods and lab exercises geologists and biologists use in their profession. This talk will focus on how we resolved the challenges regarding education during the pandemic and how the full project was carried out.

**Keywords:** Education, Cooperation, Field work, Accessibility

**Corresponding author:** [vegard.lund@geanor.no](mailto:vegard.lund@geanor.no)

**Reference:**

Vegard Lund

## The Media As Important Resources For The Recognition Of Our Heritage: Araripe Geopark

*Michel MARQUES<sup>1\*</sup>, Maria SILVA<sup>1</sup>, Pedrina PEREIRA<sup>1</sup>, Sarah PEREIRA<sup>1</sup>,  
Araripe UNESCO Global Geopark<sup>1</sup> Brazil, Araripe UNESCO Global Geopark<sup>1</sup> Brazil, Araripe UNESCO Global Geopark<sup>1</sup> Brazil,  
Araripe UNESCO Global Geopark<sup>1</sup> Brazil*

Araripe Geopark was created in 2006, and consequently became the first geopark in the Americas recognized by UNESCO and the only one in Brazil. Since then, its Communication sector was established with the pioneering mission of disseminating, raising awareness and adding the role, so new at that time, of this UNESCO equipment with the purpose of promoting sustainable development and tourism, which until then, practically, did not exist in the region, together with the local community. Initially, this work took the form of a printed newspaper and distributed in strategic places in the region, with a circulation that reached 30 issues of up to 5,000 copies, dissemination in communication vehicles such as radios, newspapers, television channels and e-mails in direct mail service. With the appearance of new media, through the internet, today, we have more freedom, reach and tools for dissemination, in particular the website, which is the great showcase, Facebook, where we perceive a more informal and direct approach with the public, which helps in better engagement and a good relationship with the consumers of our content. Furthermore, we have Instagram, from which we observe the greatest power of reach, response and multiplication of information. Geopark Araripe's Instagram had its first publication in 2016 and currently has a profile of 5,870 followers. This article aims to explain how we have used the peculiar characteristics of each media for a better dissemination role and the return obtained from these observations, such as, for example, the best times for publication, the number of publications per day, the size of the explanatory text, the strength of the use of pareidolia in the images, the response time, the reach in corporate and territorial terms, the use of colors in relation to their aesthetic aspects, types of reposts that may be relevant, in addition to the importance of encouraging tagging of other profiles and use of hashtags. Therefore, the perspectives developed in this work demonstrate the significance of using such media resources as content promotion tools about the Araripe Geopark, which when used correctly generate great results that provide a recognition of the heritage territory on a larger scale.

**Keywords:** Araripe Geopark, Communication Sector, Internet Media

**Corresponding author:** michel.macedo@urca.br

**Reference:**

CEARÁ. GeoPark Araripe: Histórias da Terra, do Meio Ambiente e da Cultura. Secretaria das Cidades/Projeto Cidades do Ceará Cariri Central. Crato-CE, 2012.

## Smart, Sustainable And Inclusive Management Of 516 Arouca (Arouca UNESCO Global Geopark – Portugal)

*Verónica BERNARDO<sup>1</sup>, Alexandra PAZ<sup>2</sup>, Ana PINTO<sup>1</sup>, Daniela ROCHA<sup>2\*</sup>,*

*Câmara Municipal de Arouca<sup>1</sup> Portugal, AGA-Associação Geoparque Arouca<sup>2</sup> Portugal, Câmara Municipal de Arouca<sup>1</sup> Portugal,  
AGA-Associação Geoparque Arouca<sup>2</sup> Portugal*

516 Arouca is the name of the most recent touristic attraction of the Arouca UNESCO Global Geopark (UGGp), Portugal. Inaugurated on May 2, 2021 (the date of the Arouca Municipal Holiday), its name is due to its 516 m long, and therefore the largest suspension pedestrian bridge, of this type, in the world. This is an infrastructure made by 127 decks of metal grating and steel cables, with a height of 175 m above the Paiva River. This bridge located over the famous Paiva Walkways and next two geosites (Paiva Gorge and Aguieiras Waterfall) won, this year, a «World Travel Award» as «Europe's Leading Tourist Attraction Development Project». A smart, sustainable and inclusive management of 516 Arouca was carefully prepared before its inauguration, taking into account the experience acquired in managing the Paiva Walkways affluence, avoiding the risk of excessive tourist pressure and its impacts. Thus, an official website, integrating an online booking system, was implemented ([www.516arouca.pt](http://www.516arouca.pt)), with controlled limits and timetables and whose visits are always accompanied by guides who, in addition to interpreting the infrastructure and the landscape, play a role in raising awareness of sustainable conduct and practices. Additionally, to control the flow and quality of visitation, 516 Arouca employs a team of controllers, responsible for the proper functioning of the infrastructure and support for visitors/guides. Both teams have previously received training about Arouca UGGp values and heritage, first aid as well as on the managing of panic/stress situations. It is also important to note that the access to the bridge is done on foot, with car parks being located more than 10 minutes away by walk. This is also an inclusive tourist infrastructure having received several visits so far of people in wheelchairs and other disability problems. At the time of its opening, the media coverage exceeded all expectations, leading to 516 Arouca making the news in several international communication channels, including intercontinental ones. Alongside the media, the demand was immediate. Inaugurated during the pandemic and considering that the tourism sector is one of the most affected by this public health emergency, this infrastructure is proving to be a tourist attraction at local, regional, national and even international level, having received about 90,000 visitors in 6 months.

**Keywords:** Geoparks, 516 Arouca, Smart, Inclusive, Sustainable Tourism

**Corresponding author:** [veronica.bernardo@cm-arouca.pt](mailto:veronica.bernardo@cm-arouca.pt)

**Reference:**

Rocha, D. (2020). Arouca Geopark's Route of Geosites – Guide. AGA - Associação Geoparque Arouca (Ed.), 159 p., ISBN 978-989-99633-6-8

## Mt Chelmos: The Rocks, The Mountain And The Myths As A Tool For Sustainable Development!

*Penelope PAPADOPOULOU<sup>1\*</sup>, Eleni KOUMOUTSOU<sup>2</sup>, Socrates TSACOS<sup>3</sup>, George ILIOPOULOS<sup>4</sup>,*

*University of Patras, Department of Geology<sup>1</sup> Greece, Chelmos-Vouraikos UNESCO Global Geopark<sup>2</sup> and Department of Biology, University of Patras<sup>2</sup> Greece, Chelmos-Vouraikos UNESCO Global Geopark<sup>3</sup> Greece, University of Patras, Department of Geology and Chelmos-Vouraikos UNESCO Global Geopark<sup>4</sup> Greece*

Chelmos Mt is one of the most imposing "limestone-built" mountains of Greece with an altitude of 2.355 m. It stands out for its geomorphological diversity and its rich biodiversity, all of them bonded with myths and legends! The area has a great geo-touristic value since 10 geosites have already been designated and many others are under evaluation. It is noteworthy that on this mountain rich remnants of last Pleistocene glacial periods exist and are waiting to be explored. The area is a popular destination for hiking along the two established georoutes. Moreover, its touristic value is enhanced by the famous Kalavryta Ski center and the Aristarchos telescope – the biggest telescope in the Balkan Peninsula. The special characteristics of the area provide a unique sustainable tourism opportunity. The vision of Chelmos Vouraikos UGGp for Mt Chelmos includes a series of actions aiming at the development of alternative tourism opportunities for those who seek to combine vacation with adventure and knowledge. As a first step, toposcopes and additional information signage with contemporary interactive marketing tools regarding the special geological features of the area will be placed in the most popular place of the Geopark -the Kalavryta ski center. An enhanced information point will also be created. These actions will take advantage of the high tourist numbers of the ski resort in order to raise awareness on the geological value of the whole area and redirect them to other important geosites as well. A series of other actions regarding the enhancement of mountaineering and hiking facilities, the improvement of the accessibility of geosites and georoutes, the 3D imaging of inaccessible sites and the promotion of the project will also take place. Chelmos Vouraikos is constantly working on the sustainable local development and is inviting everybody to visit Chelmos Mt. Its geodiversity, biodiversity, and intangible heritage certainly could make the visitor to want to come back again and again, because every corner of this beautiful mountain tells a story.

**Keywords:** Chelmos Mt., sustainable tourism actions, Greece

**Corresponding author:** penelpapadop@upatras.gr

**Reference:**

## Insular And Coastal Geoparks As Ideal Sustainable Tourism Destinations

*Emmanouil ANTONAKIS<sup>1\*</sup>, Nickolas ZOUROS<sup>1</sup>,  
University of The Aegean<sup>1</sup> Greece, University of The Aegean<sup>1</sup> Greece*

The last two years COVID-19 pandemic has had a massive social and economic impact. Both developed and developing economies have been hit. Islands and coastal areas have been hit hardest, as tourism is the main economic activity. COVID-19 and the restrictions in travelling reduce dramatically the number of the visitors in these areas. The restart of tourism will help kickstart recovery and growth. It is essential that the benefits this will bring are enjoyed widely and fairly. The Global Geopark Network includes 169 UNESCO Global Geoparks, 56 (33%) are located on islands and coastal areas (20 on islands 36 coastal geoparks). Main characteristics in these areas are the exceptional landscapes and rich natural and cultural heritage as well as tourism as the main economic activity. UNESCO Global Geoparks offer to their visitors unique experiences and a broad variety of outdoor activities. Insular and coastal UNESCO Global Geoparks can be also promoted as ideal destinations for athletic and action tourism. Such kind of tourism combines athletic events, adventure activities, geo-tourism and eco-tourism aspects of a discovery tour. Such tourism activities in Geoparks are low-impact, eco-friendly, socially compatible and high quality combining recreation, education and bring benefits to both the tourist as well to the visited land. Some examples of geoturistic activities that took place in various island and coastal geoparks through the pandemic are : Sitia Geopark Trail in Sitia UNESCO Global Geopark, Hiking through geosites in Toba caldera UNESCO Global Geopark, Chiburijima Island Hiking in Oki Islands UNESCO Global Geopark, the Petrified Forest adventure MTB in Lesvos island UNESCO Global Geopark, etc. Insular and coastal UNESCO Global Geoparks need to use new tools for their promotion as sustainable tourism destinations. Thematic common presentation and joint promotion of their natural beauty, natural and cultural heritage, local resources and geo-touristic activities could strengthen their attractiveness as emerging tourism destinations. Examples of such activities took place in various insular and coastal Geoparks: the Sitia Geopark Trail in Sitia UNESCO Global Geopark, the Hiking through geosites in Toba UNESCO Global Geopark, the Chiburijima Island Hiking in Oki Islands UNESCO Global Geopark, the Petrified Forest adventure MTB in Lesvos island UNESCO Global Geopark, etc. Geoparks promote geo-heritage sites and connect them with outdoor sport activities. Geo-tourism activities have drawn worldwide attention and led to a growing number of visitors. Networking between the insular and coastal geoparks help in exchanging good practices and knowledge on tourism development.

**Keywords:** Geotourism, Insular geoparks, Coastal geoparks

**Corresponding author:** manolis.antonakis@rocketmail.com

**Reference:**

Zafeiropoulos, G.; Drinia, H.; Antonarakou, A.; Zouros, N. From Geoheritage to Geoeducation, Geoethics and Geotourism: A Critical Evaluation of the Greek Region. *Geosciences* 2021, 11, 381. <https://doi.org/10.3390/geosciences1109038> Zouros, Nickolas C. "Lesvos Petrified Forest Geopark, Greece: Geoconservation, Geotourism, and Local Development." *The George Wright Forum*, vol. 27, no. 1, George Wright Society, 2010, pp. 19–28, <http://www.jstor.org/stable/43598131>.

## New Interactive Exhibition on the Diverse Volcanic Heritage of Bakony – Balaton UNESCO Global Geopark, Hungary

*Barnabas KORBELY<sup>1\*</sup>,*

*Bakony–Balaton UNESCO Global Geopark<sup>1</sup> Hungary*

Bakony–Balaton UNESCO Global Geopark, founded and managed by Balaton Uplands National Park Directorate, has an internationally significant and unique volcanic heritage: in the Bakony–Balaton Uplands Volcanic Field there were about 50 volcanoes active in the period 8–2.3 million years ago. Thanks to the relatively young age, the recent landforms clearly show that this landscape was "born in fire". As the volcanoes erupted in a wet, marshy environment, phreatomagmatic volcanism was typical: due to magma-water interaction, eruptions were usually explosive at first. Maars/diatremes, tuff rings, lava lakes and, in the last phase of volcanic activity, cinder cones were formed in the marshland. The loose Pannonian sediments around the craters were eroded away by erosion processes, resulting in the formation of the characteristic shaped volcanic remnant hills (their contours can be seen in the logo of our Geopark). Hegyestu Geological Visitor Site near Monoszlo village is an important geotourism destination: the spectacular columnar basalt (or more precisely, basanite) rock faces, exposed by the quarrying that took place here until the 1960s, and the beautiful panorama attract tens of thousands of visitors every year. This geosite was one of the promoted destinations in a domestic integrated communication campaign ("Hungary is waiting for you") of the Hungarian Tourism Agency in 2017 (hundreds of billboard posters along national motorways, in Budapest, etc.). Significant improvements were made here in the frame of the Interreg Danube GeoTour project. One of our volcanic trails in this region, the evocatively named "Route of Fire", has its start point here and lures hikers into the world of the once raging volcanoes. But the visitor site's exhibition has also been thoroughly revamped, with a state-of-the-art multisensory exhibit on the processes of volcanism. Other topics of Earth science are also covered, including tectonic movements and earthquakes (e.g. a touch screen shows where and when earthquakes have struck in the Pannonian Basin). Networking, a very important keyword in the world of Geoparks, is also part of the exhibition: not only we present our project partners from the Czech Republic to Serbia, but we also have a video for a 3D volcano installation and, in a separated movie room, another short film on Fagradalsfjall eruption from Reykjanes UNESCO Global Geopark, Iceland. Because Geoparks are not just about rocks, but also about the people who live there, the exhibition features the traditional viticulture of the region, based on volcanic soils, and some Geopark Products that are sustainably produced by our partners. In the frame of "Hidden Treasures in Balaton Uplands National Park" project, new interpretive panels (in Hungarian, English and German), a playground for children were installed, and our visitors now are pampered with new benches outside – so this is an ideal place for learning, relaxing and hiking.

**Keywords:** geotourism, volcanic heritage, visitor site, exhibition, networking

**Corresponding author:** korbely@geopark.hu

**Reference:**

Martin U. and Nemeth K. (2002) Mio-/Pliocene phreatomagmatic volcanism in the western Pannonian Basin. – *Geologica Hungarica series Geologica* 26. 198 p. <http://hdl.handle.net/10179/9641> Harangi S. (2014) Volcanic Heritage of the Carpathian–Pannonian Region in Eastern-Central Europe. In: Erfurt-Cooper P. (eds) *Volcanic Tourist Destinations. Geoheritage, Geoparks and Geotourism (Conservation and Management Series)*. Springer, Berlin, Heidelberg. [https://doi.org/10.1007/978-3-642-16191-9\\_7](https://doi.org/10.1007/978-3-642-16191-9_7)

## Geotourism Strategy in Portuguese UNESCO Global Geoparks

*Joana RODRIGUES<sup>1\*</sup>, António DUARTE<sup>2</sup>, Manuel Paulino COSTA<sup>3</sup>, Antónia MORAIS<sup>4</sup>, Emanuel CASTRO<sup>5</sup>,  
Naturtejo UNESCO Global Geopark<sup>1</sup> Portugal, Arouca UGGp<sup>2</sup> Portugal, Azores UGGp<sup>3</sup> Portugal, Terrasde Cavaleiros UGGp<sup>4</sup> Portugal,  
Estrela UGGp<sup>5</sup> Portugal*

Portuguese UNESCO Global Geoparks started a common strategy for Geotourism in Geoparks, together with the Tourism of Portugal, the Portuguese National Tourism Authority. Portugal has currently five UGGps: Naturtejo, Arouca, Azores, Terras de Cavaleiros and Estrela, all of them with their own geotourism strategies, sharing the same goals for the sustainable territorial development. At the begging a 'Code of Conduct and Best Practices' was created, with common guidelines and recommendations, fostering safe visits and contributing to the preservation of the natural and cultural heritage and to the well-being of local communities. At the same time, it was promoted a Webinar Series to introduce the Geopark concept and to demonstrate the tourism potential both to the general public and to tourist stakeholders, in order to stimulate the development of tourist products and services in the Geoparks. In the context of the COVID-19 pandemic, the seal "Clean & Safe" for Geoparks was developed, adapting the certification created by the Tourism of Portugal to these specific territories, which ensures the cleaning requirements for the prevention and control of the virus. Greatefforts were made on training tourism stakeholders and in creating an innovative educational offer. The Executive Training Course 'Geotourism by Geoparks' was developed by the Tourism of Portugal Schools together with the UGGps and it was integrated in the Digital Academy, a national educational platform for specialized training in Tourism. After the great success of the first edition, hundreds of people from all over the country are pre-registered for the next editions. Regarding a common tourist offer, Portuguese UGGps are implementing the GEOfood brand together, creating a national strategy for sustainable food in Geoparks, including procedures, capacity building, tourist experiences, promotion and marketing. A "Scientific Research Portfolio" was also created, representing an innovative tourism product, destined to academics, researchers and higher education students. It gathers information about science and research, as also the logistic support to researchers, with first person testimonials of renowned researchers from all over the world. The 100% Responsible Programs of Tourism of Portugal are being implemented in UGGps. Companies can certify their programs through a commitment to sustainable practices in Geoparks. UGGps integrated the "+ Sustainable Tourism Plan 20-23" of the National Tourism Authority, a strategic document, focused on the Agenda 2030, with specific actions, that aim to promote sustainability in Tourism. Alongside these initiatives, a joint communication strategy on social media was also developed for tourism promotion and institutional communication. These common approach and jointed initiatives are reinforcing the tourism strategies of each UGGp but also bringing a greater visibility to the Geopark concept in Portugal and strengthening the Portuguese Network.

**Keywords:** Portuguese UNESCO Global Geoparks, geotourism, sustainable tourism destinations, networking

**Corresponding author:** joana.rodrigues@naturtejo.com

**Reference:**

Rodrigues J. Duarte A. Costa M. P. Morais A. Castro E. Geotourism Strategy in Portuguese UNESCO Global Geoparks

## The Development Of The Idrija Selected Collective Trademark In The Idrija UNESCO Global Geopark

*Urška BAJEC RUPNIK<sup>1</sup>\*,  
Idrija Tourism Board<sup>1</sup> Slovenia*

The Idrija Selected quality certificate is awarded to products and services that meet high quality standards, incorporate locally sourced materials, or relate to the tradition, culture, and way of life of the people inhabiting the area of the Idrija UNESCO Global Geopark. With a selection of high-quality products, a coherent graphic identity, and a collective promotional strategy, the trademark contributes to the recognisability of local products and services, enhances their added value, connects local providers, and fosters sustainable development in the region. The trademark was established in 2018 with funding by the European Danube GeoTour project, which also provided a definition of geoproducts. A system for awarding certificates was formed, along with rules, a coherent graphic identity, and a marketing strategy. Several workshops for local providers were also organized. The principal themes of the Idrija Selected collective trademark are gastronomy and local folk and artistic artisanship. Training, counselling, and evaluation are thus available for providers of artisan products or unique handcrafted or factory-made products, culinary products or food-and-beverage products served in a restaurant manner, as well as events with a culinary emphasis and tourism programs or experiences. Currently, the trademark register includes 41 providers. The quality certificate was awarded to 46 artisan products, 54 culinary products, 15 dishes served in a restaurant manner, 5 tourism programs, and one gastronomical event. Certificates are awarded and (re-)evaluated yearly by an independent commission of experts. Throughout the year, workshops for providers and other promotional activities are organized. The providers can apply for individual counselling to develop and upgrade their products, stories, and visual design with the help of a counsellor. The Idrija Geopark regularly includes providers with certificates in its activities. The activities related to the trademark contribute to the development of the local economy, innovative solutions, creativity, and the inclusion of tradition in production and technological processes based on the heritage of the region. The trademark functions as a means of connection – when joined, individual products become new offers, such as gastronomic events using certified products and breakfast - or picnic baskets of Idrija Selected products. In three years, the trademark has become a recognizable symbol of quality among local providers and consumers alike.

**Keywords:** collective trademark, local products, geoproducts, sustainable development, local development

**Corresponding author:** [urska.b-rupnik@geopark-idrija.si](mailto:urska.b-rupnik@geopark-idrija.si)

**Reference:**

## Digital Tools In COVID Times To Promote Sustainable Development At Psiloritis UGGp, Greece

*Charalampos FASSOULAS<sup>1\*</sup>, Emmanouel NIKOLAKAKIS<sup>2</sup>,*

*Psiloritis UGGp, Natural History Museum of Crete, Univ. of Crete<sup>1</sup> Greece, University of Crete<sup>2</sup> Greece*

The last decades we have become witnesses of fast evolving changes in the technology known as Accelerating Change, pushing the technological evolution to provide its products faster to a wider part of the population for numerous applications. Virtual Reality (VR) is a field that is becoming of great interest in geoparks too, which is also relevant due to COVID-19 Pandemic. To face the impacts of the pandemic Psiloritis UGGp exploited all possible resources and tools to increase digital promotion of geopark, share digital experiences to the public, keep alive connections with our stakeholders, visitors and inhabitants and develop more tools to support local sustainable development. Based on earlier digital tools we developed a campaign under the title "Geopark supports its supporters" that took place through social channels using the digital tools to promote our individual stakeholders and local producers, that had received geopark's label and their products. In addition, among the changes that this period brought to our lives was the re-addressing of targets and goals of a HORIZON 2020 project titled RURITAGE in which geopark was participating as a Role Model for resilience. Funds were reallocated in order to develop and support local Enhancement plans to drive and boost local sustainable development in post-COVID times based on our rural heritage and products. For Psiloritis the plan set priorities to use modern technologies (virtual maps, tours and VR) to enhance and promote local heritage and products; establish local participative processes to better manage and conserve our natural and cultural environment; and to organize public events to strengthen local identity and pride. Under the implementation of the plan two new-story telling maps were developed focused on religious sites of geopark and on the enhancement of the emblematic geosite of Nida Plateau. Also, a business listings directory with the affiliated enterprises of the Geopark was developed for the promotion of our local producers and their products. These are hosted on a public bilingual website <https://storymaps.nhmc.uoc.gr/> that will give the opportunity for further adding and expanding appropriate information in the future. In this website two independent Virtual Tours are embedded, one for each Story Map. One is the Virtual Tour of Psiloritis geopark which was enriched with more panoramas and the other is the Virtual Tour of Nida plateau. For the Nida plateau virtual tour, an optimized VR tour for local reproduction in VR headsets is offered at Geoparks' info center in Anogia and at the Natural History Museum of Crete at Heraklion. We think that such digital tools not only may be useful in other similar strange situations, but will also attract more visitors, especially of younger ages, promote further our geopark and its products, and offer the ability to those un-able for various reasons to travel to experience from distance part of Psiloritis' beauty and treasures.

**Keywords:** Psiloritis, Story-telling, Virtual tour, Geotourism, RURITAGE

**Corresponding author:** fassoulas@nhmc.uoc.gr

**Reference:**

Fassoulas C. & Nikolakakis E. (2021). Digital tools in COVID times to promote sustainable development at Psiloritis UGGp, Greece.

## Integration of culture and geotourism in Longhushan UNESCO Global Geopark

Jieting FAN<sup>1\*</sup>,

Longhushan UNESCO Global Geopark<sup>1</sup> China

The solid development of a Geopark is supposed to be developed by the interplay of scientists, local communities and visitors, and present a overall picture about the culture and natural resources of a geopark, which can promote the protection of the cultural relics and geohéritages of a geopark. Therefore, the strategy of integration of culture and geological heritages into geotourism is becoming more and more popular in recent years. Longhushan UNESCO Global Geopark, covering an area of 996.63 km<sup>2</sup>, is situated on the northern piedmont of the Wuyi Mountain Range in the northeast of Jiangxi Province, southeast China. It boasts spectacle Danxia landforms, eye-catching peaks and unusually-shaped rocks, such as the Fairy Maiden Rock, Elephant Trunk Hill, and Turtle Rock. The geological heritage of the Geopark features Danxia landforms, as well as volcanic landforms, sedimentary structures and type sections. Longhushan UGGp is the birthplace of Chinese Taoism which has profound influence on Chinese culture and even on current Chinese society. Longhushan UGGp is well-known for Danxia landforms, the Cradle of Taoism and the cliff burial culture of the Spring-Autumn Warring States Period. With the rich and abundant cultural relics in the Geopark, Longhushan Geopark Administrative Committee establishes new programs that integrate the culture into geotourism for visitors, such as “Dream of Tao” live performance, which is a dance narrative epic in the real maintains and rivers. Also presented performance and songs are from the local history. The dance show “dream of Tao” impressed visitors a lot. Moreover, the Yiyang Opera of Longhushan UGGp, is a local traditional opera in Guifeng Area of the Geopark. In order to inherit the intangible heritage, the Geopark Administrative Committee organize free show along the geopark trails during weekends and national holidays for visitors. And provide the geopark school students free training courses of the Yinyang Opera besides free geosciences popularization training. Also, the geopark assists the Restaurant Association of the geopark to create a series of cultural-related geopark food menus, which has been provided very popular with visitors. Culture is the fruit of a geopark which is consider a long-term accumulation of a local people’s life. Through these activities, Longhushan UGGp successfully provide more programs for visitors and integrate culture into geotourism. In addition, with the development of the new industries, more local people are employed.

**Keywords:** Sustainable development, Longhushan UGGp, Geotourism, Integration of culture and geotourism

**Corresponding author:** fren2014@hotmail.com

**Reference:**

Hakim L, Soemarno M. Biodiversity conservation, community development and geotourism development in bromo-tengger-semeru-arjuno biosphere reserve[J]. *Geojournal of Tourism and Geosites*, 2017, 20(2): 220-230. Tomić N, Marković S B, Antić A, et al. Exploring the potential for geotourism development in the Danube Region of Serbia[J]. *International Journal of Geohéritage and Parks*, 2020, 8(2): 123-139. Adriansyah D, Busu I, Eva H, et al. Geohéritage as the basis of geotourism development: a case study in Jeli district, Kelantan, Malaysia[J]. *Geojournal of Tourism and Geosites*, 2015, 15(1): 25-43. Erfurt P. Geotourism development and management in volcanic regions[M]//*Handbook of geotourism*. Edward Elgar Publishing, 2018.

## Djerdap UNESCO Global Geopark

*Jovana MARINKOVIĆ<sup>1\*</sup>,*

*Public Enterprise Djerdap National Park<sup>1</sup> Serbia*

Djerdap UNESCO Global Geopark covers the territory of 1.330 km<sup>2</sup>, including area of Djerdap National Park. The most significant natural phenomenon in the area of Djerdap UNESCO Global Geopark is Djerdap Gorge, along which there are numerous geoheritage objects from almost all periods of geological history. The main features of Djerdap are preserved environment, the marked geodiversity, diversity of flora and fauna, the richness of cultural heritage. Therefore, Djerdap UNESCO Global Geopark has the potential to become a unique open-air laboratory, in which geological, ecological and civilizational history will be presented. The visitors of Djerdap UNESCO Global Geopark can see, walk through, touch and enjoy in natural, cultural and historical values of one of the richest areas in Serbia. Geopark heritage This part of Serbia is especially distinguished by a large number of caves and overgrowth, and its uniqueness is complemented by beautiful waterfalls of the Djerdap UNESCO Global Geopark. While the easternmost part of the Djerdap UNESCO Global Geopark represents a rim of the Dacian basin, most of the Geopark's territory belongs to the Carpathians and the Balkan Mountains of eastern Serbia. These mountain ranges stand for the northern branch of Alpine belt, formed under highly varied geological conditions, including intensive uplifting, fracturing, secondary erosion modification and intensive karstification processes. The Geopark area has a long geological history. The oldest rocks, exposed on six geosites, are from the Upper Proterozoic. Various Paleozoic units outcrop on seven geosites. In the Jurassic, the entire area was invaded by marine transgression and the sedimentation cycle continued there until the beginning of the Upper Cretaceous. Therefore, a vast majority of geosites are developed in Mesozoic (Jurassic to Lower Cretaceous) units. Additionally, four geosites are located in Neogene and five geosites in Quaternary formations. The majority of geosites are dedicated to representative rock exposures/outcrops and karst landforms (caves, natural arches, karst springs, waterfalls), as well as to beautiful viewpoints in the Djerdap area. The main advantages of Djerdap are: unpolluted environment; diversity of natural resources, geological in particular; attractive landscapes; rich flora and fauna; numerous cultural and historical attractions; and kindness and hospitality of local residents. The Djerdap area has the chance to become a unique natural, open-air laboratory in which geological, ecological and civilization history of this part of southeast Europe will be presented and interpreted to visitors. In direct and active contact with nature, it is expected that visitors will learn about local plants and animals and their habitats, as well as the environment of prehistoric man, and thus understand the unbreakable link between the two main components of nature – geodiversity, and biodiversity.

---

**Keywords:**

**Corresponding author:** jovanamarinkovic@npdjerdap.rs

**Reference:**

Geotourism Visitor centers Djerdap National Park's Visitor's Center The exhibition in the Visitor Centre of the Djerdap National Park in Donji Milanovac shows the geological structure of the area, the variety and great numbers of species of animals and plants, the most important cultural and historical landmarks, as well as tourist attractions of the biggest National Park in Serbia and the first geopark in Serbia, Djerdap UNESCO Global Geopark. The exhibits are followed by the explanations in Serbian and English, tactile exhibitions and the Braille Alphabet. Visual, textual and multimedia display of the uniqueness of the area is set to raise consciousness about a responsibility of every man as well as society to preserve their natural environment and geological and cultural heritage.

## The Geoconservation Project Along The Maroullena Riverbed Is The Result Of An Ideal Collaboration Between The Geopark Team, Local Community And Government Departments

*Efthymios TSIOLAKIS<sup>1\*</sup>, Vasilis SYMEOU<sup>1</sup>, Christodoulos HADJIGEORGIOU<sup>1</sup>, Michalis CHRISTODOULOU<sup>2</sup>, Petros HADJICOSTAS<sup>2</sup>, Cyprus Geological Survey Department<sup>1</sup> Cyprus, Cyprus Geological Survey Department<sup>1</sup> Cyprus, Cyprus Geological Survey Department<sup>1</sup> Cyprus, TROODOS DEVELOPMENT COMPANY<sup>2</sup> Cyprus, TROODOS DEVELOPMENT COMPANY<sup>2</sup> Cyprus*

The Maroullena river is located at the north central edge of the Troodos Ophiolite Complex (TOC), with exquisite geological and natural elements. In 2015, the Community Council of the Kalo Chorio Oreinis village in their effort to promote the exceptional beauty of the area, created the 4.7 km long "Pikrovrisi tis Merikas" nature trail. The trail starts from a Venetian bridge, next to Merika natural spring, it passes through the Maroullena gorge using wooden steps with railings and small-scale infrastructures friendly to the environment such as a wooden bridge and wooden sidewalks, and finally ends at the picnic site called "Merika". Along the riverbed valley hikers can walk near small lakes, which are the natural habitat of the endemic water snake subspecies "Natrix-Natrix cypriaca" as well as a significant number of endemic flora and bird species that live, nest and reproduce in the area indicating why the area is included within Natura 2000 EU network. Furthermore, near the Venetian bridge is located the most important geosite of the Troodos UGGp. It is a spectacular exposure of volcanic rocks of the Lower Pillow Lavas along a slope in the Maroullena river gorge, which is a classic reference locality for the study of these type of rocks. A lower unit of hyaloclastites and an upper unit of pillow lavas, were cut by swarms of near vertical dykes, which are the natural recorders of the submarine volcanic activity that initiated on the ocean seafloor approximately 92 mya. The pillow lavas were formed by the extrusion of slowly flowing viscous magma, the hyaloclastite breccia that is rich in black volcanic glass, was formed during underwater volcanic eruptions either by fragmentation or by thermal shock of the lava rock during rapid cooling, while the dykes represent the transport conduits and feeder channels of younger lava extrusions on the seafloor. The repeated flooding events of the last years, completely destroyed all the small-scale wooden infrastructures within the riverbed, provoking a heartbreaking image in one of the most impressive nature trails of the Troodos UGGp. Since 2020, a great effort has been taken by the Local Community Council, the Cyprus Geological Survey Department and the operator of the Troodos UGGp to restore the trail along the riverbed. The new infrastructures include several tens of meters of elevated wooden sidewalk along the riverbed and a fourteen-meter-long metallic frame bridge with wooden floor and railings, based on two concrete bases on either side of the river banks, that are clad with local rocks. Furthermore, a new view point with a platform will be constructed on top of the river slope opposite the geosite, that will be reached by the visitors from the riverbed via a number of wooden steps with railings. The geoconservation project will strengthen the geotouristic product of the community as a result of an ideal collaboration between the geopark team, the local community and the government departments.

**Keywords:** Geoconservation, Sustainable development, Geopark, Troodos, Cyprus

**Corresponding author:** etsiolakis@gsd.moa.gov.cy

**Reference:**

Constantinou G., Xenophontos C., Kramvis S., Afrodisis S., Michailidis P. & Panayides I. (1997) - The Geology of Cyprus. Cyprus Geological Survey Department, Bulletin No. 10, p.142 (in Greek). Edwards S., Hudson-Edwards K., Cann J., Malpas J. & Xenophontos C. (2010) - Classic Geology in Europe Series, Cyprus, v7, p.271.

## Conservation of heritage values in Non nuoc Cao Bang Geopark territory

*Hieu DUONG<sup>1\*</sup>,*

*Non nuoc Cao Bang UGGp<sup>1</sup> Vietnam*

Non nuoc Cao Bang is located in a mountainous area in North Vietnam. It is about 300km from Hanoi, the capital city. Non nuoc Cao Bang was established in 2015 and recognized as a UNESCO global geopark in 2018. Non nuoc Cao Bang possesses exceptional geological heritage, beautiful pristine landscapes, lots of tangible and intangible cultural heritages and well-persevered traditional cultures of ethnic groups. Besides, its biodiversity is noticeable with different endemic species. Also, Cao Bang is a historic land associated with the historical events of the nation. The UNESCO Global Geopark label is the evidence of the potential and efforts of Cao Bang in protecting, conserving geological heritage as well as other heritages and our efforts towards sustainable development. 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. This presentation will clarify the collaboration of relevant agencies and communities activities and plans carried out to protect, conserve and promote the heritage values in Non nuoc Cao Bang UGGp territory for sustainable development.

**Keywords:** conservation of heritage, geological heritage, tangible and intangible heritages, collaboration, sustainable development

**Corresponding author:** duonghieu.e16@gmail.com

**Reference:**

Non nuoc Cao Bang geopark's documents

## Discussion on Internet + Geotourism under the Epidemic

*Chenggong ZHANG<sup>1\*</sup>, Qingsong HUANG<sup>2</sup>,  
Mount Kunlun UGGp<sup>1</sup> China, GGRC<sup>2</sup> China*

In the past two years, due to the epidemic situation, most of the work in the geopark has been stagnant or slow. The difficulties in international exchanges of the geopark, the difficulty in popularizing science, and the unsustainable funding for the construction of the geopark pose great challenges to the park. In order to cope with the current special situation, maintain the development of the geopark, make the park survive, and prepare the park for major development after the epidemic. The author led the team to do a lot of work for the park. In particular, the use of methods combined with the Internet, starting with scientific research transformation, resource census, and science popularization, has achieved good results. This article will introduce the team's work experience in terms of work process and work effectiveness, in order to provide a reference for other parks facing similar difficulties.

**Keywords:** Mount Kunlun, Geopark, Internet +, Epidemic, Geotourism

**Corresponding author:** zcgdash@hotmail.com

**Reference:**

Mount Kunlun UNESCO Global Geopark Work Summary 2020-2021

## Research on Biodiversity and Protection Strategy of Mount Cangshan in Dali

*Xiaokang HU<sup>1\*</sup>, Jianguo WANG<sup>2</sup>,*

*Dali University<sup>1</sup> China, Dali Mount Cangshan Global Geopark Administration<sup>2</sup> China*

The 2020 UN Biodiversity Conference will be held in Kunming, China, with key topics such as conservation of ecological diversity, the building of an ecological civilization, the harmonious coexistence of human and nature and the building of a community of life on earth. With a vertical height difference of 2,000 meters, the Dali Mt. Cangshan has a distinct climatic and vegetation zoning and remarkable biodiversity, which makes it a branch venue of this conference. Under this background, Dali Mt. Cangshan UNESCO Global Geopark carried out a comprehensive scientific investigation in Mt. Cangshan, identifying its background of animal, plant resources and environmental occurrence status, and discovering four newly-discovered insects and nine newly-recorded species there. This paper will introduce the current status of biodiversity, the measures taken, and the issues and challenges faced in Mt. Cangshan based on the comprehensive scientific investigation. Based on the construction of a community of life on earth, it will explore the conservation strategies of biodiversity from policies and regulations, alien species, ecological safety, ecotourism, cross-regional cooperation and environmental education, and actively provide a scientific basis for the sustainable development of the geopark.

**Keywords:** Biodiversity, Scientific Investigation, Issues and Challenges, Community of Life, Conservation Strategy

**Corresponding author:** yndlcsdzgy@163.com

**Reference:**

1.Xiaokang Hu, etc. Comprehensive scientific investigation report of Mt. Cangshan[R]. Anhui Agri. Sci. Bull.2010. 2.Guowei Hong. Research on the causes of biodiversity decline and its conservation strategies[J]. Dali University,2021.

## Tangible And Intangible Culture Diversity; Preservation And Education Ciletuh Palabuhanratu UGGp

*Saprudin SAPRUDIN<sup>1\*</sup>,*

*Board Management CPUGGP / Universitas Muhammadiyah Sukabumi<sup>1</sup> Indonesia*

Culture is one of the geopark elements, that the culture consist of two kinds are tangible and intangible culture. The existing of culture at the geopark is very important, if the geopark lost of the culture so the geopark can not be a geopark. Tangible culture is the culture can be seen and can be touch by the people for example fossils, building, thing, device, and others. Meanwhile intangible culture that the culture cannot be seen and, but the culture only can be felt, can be tasted can be heard. One of the cultures can be seen and touch that is Megalodon Fossils that have been founded at Gunung Sunggung Village, Sukabumi Regency around 2020 by the people who life in nearest from the megalodon situ. Megalodon is the Bog Giant Shark that live in thousands of years ago. After The Megalodon have been founded the people do the preservation by build the small museum in situ for keep the fossils. The founder of the fossils not only keep the museum but also, they are preserve the fossil so that it can be endure. Conducting to the Megalodon founded, we can also preserve the intangible culture that are naming, traditional food, and handy craft. One of the intangibles of the culture is the name of Gunung Sunggung Village. Sunggung came from the Sundanese in Bahasa is senyum. Its mean smile. The word sunggung refers to the place that the in situ of Megalodon will be give the good effect to the people who live around megalodon in situ. The people feel happy when they are knowing that Megalodon will give the happiness to their live. And they think when megalodon and culture at Gunung Sunggung develop automatically the culture will be preserved and also the visitor want to know megalodon and also the culture that still exists until now and also to be a big history of CPUGGp. For education the people we should have cooperation both the education insitution and also goverment and local officer. To educate the peopel firstly we can teach them what is the geopark, what is the culture and making saparation about tangible and intangible. its acn be done because not all the people can understand about the kinds of culture so that we can teach them little by little. After they undrestand about the culture we can give the ndrstanding about preservation. Conducting the megalodon in situ and the culture that exists around it, we can mach each other. So this way we can do the preservation and education, and the people can ndrstand the significances of geopark especially CPUGGp.

**Keywords:** CPUGGp, Sukabumi Regency, Tangible, Intangible, Culture

**Corresponding author:** [saprudin@ummi.ac.id](mailto:saprudin@ummi.ac.id)

**Reference:**

1. Potensi Seni Budaya Kawasan Geopark Ciletuh Sukabumi, 2016. Dinas Pariwisata dan Kebudayaan Jawa Barat
2. Pengantar Antropologi, Harsojo

## Fossil Research in the Burren and Cliffs of Moher UGGp

*Eamon DOYLE<sup>1\*</sup>,  
Burren and Cliffs of Moher UGGp<sup>1</sup> Ireland*

Despite a long history of visits from national and international geologists to the Burren and Cliffs of Moher UGGp, recent research work by the Geopark geologist has led to new discoveries that add to our understanding of the fauna of the Carboniferous rocks in the area and prove that there is still much work to be done. New finds of crinoid material, including description of a new columnal morphogenus and species *Heloambololumnus harperi* was published in 2019 by Donovan and Doyle in the journal *Proceedings of the Geologists' Association* as well as a separate publication in 2020 in the same journal describing the significance of crinoid columnals from the Geopark area. A further publication on new crinoids is in preparation as more new discoveries have been made recently. Other finds include important new tetrapodomorph material, previously unknown in the area which was published in 2019 by Doyle and Ó Gogáin in the *Irish Journal of Earth Sciences*. Another publication based on a more recent tetrapodomorph find is currently in preparation. Some of the cephalopod fauna here has received some notable research in the past, however new finds of orthoconic nautiloids will add to that previous research and new taphonomic studies of the ammonoids fauna will shed new light on their preservation. An initial study of new material from the Pennsylvanian fish fauna including acanthodians and chondrichthyans was presented at the national IGRM meeting in 2019. In addition to body fossils, trace fossils are important in the Geopark area and discovery of new vertical trace fossils assigned to *Psilonichnus* was published in 2021 by Doyle, Orr and Murray in the journal *Ichnos*. Ongoing research on the locally abundant trace fossil *Psammichnites* will lead to a publication in 2022. An article on conservation issues when using fossils to promote the Geopark was published in *Geoconservation Research* in 2021 as part of the European Geoparks Network thematic issue.

**Keywords:** Carboniferous, Burren, Crinoid, trace fossil, tetrapodomorph

**Corresponding author:** edoyle@clarecoco.ie

**Reference:**

Donovan, S.K and Doyle, E. 2019. Utility of crinoid columnals in palaeontology illustrated by a new species: Clare Shale Formation (Carboniferous), Doolin, County Clare, western Ireland. *Proceedings of the Geologists' Association*, 130: 696-700  
Donovan, S.K. and Doyle, E. 2020. Significance of crinoid preservation: Clare Shale Formation (Upper Carboniferous), Fisherstreet Bay, Doolin, County Clare, Ireland. *Proceedings of the Geologists' Association*, 131: 601-603  
Doyle, E. and Ó Gogáin, A. 2019. Tetrapod bones from the Clare Shale Formation (Pennsylvanian, Bashkirian) of County Clare, Ireland. *Irish Journal of Earth Sciences*, 37: 19-25  
Doyle, E. Orr, P. and Murray, J. 2021. The earliest occurrence of the ichnogenus *Psilonichnus*: a new record from the Mississippian of the West of Ireland. *Ichnos*, 28: 208-216  
Doyle, E. 2021. Exposed! The Public Life of Carboniferous Fossils in the Burren and Cliffs of Moher UNESCO Global Geopark, Ireland. *Geoconservation Research*, 4: 245-254

## Tectonic Setting Of The Hisaralan Geothermal Travertine Chimneys Of The Aspiring Ida Madra Geopark (Turkey)

Inan ULUSOY<sup>1\*</sup>, Erdal GÜMÜŞ<sup>2</sup>,

Hacettepe University<sup>1</sup> Turkey, IdaMadra Aspiring Geopark, Balıkesir University<sup>2</sup> Turkey

The Hisaralan geothermal travertine field at Balıkesir/Sindirgi/Hisaralan is one of the 11 geodiversity hotspots of the Aspiring Ida Madra Geopark. The territory hosts active and fossil travertine chimneys and terrace formations. This research aims to put forward the geotectonic origins and geological history of these outstanding natural monuments. The geothermal travertine field is located within the E-W trending Simav Graben, an active tectonic system of the Anatolian plate formed during the neotectonics period. The basement rocks of the geothermal area are dominated by Early Miocene volcanic rocks comprising dacites, rhyolites, breccias, resedimentary units, and pyroclastic deposits. The geothermal system associated with travertines was formed on these volcanic rocks, and controlled by NE-SW trending oblique faults, horst-graben related systems and the Simav fault. The intense natural discharge of mineral-rich geothermal fluids varying from 58 to 96 °C degrees created travertine chimneys up to 10 meters. The extremophile archaeobacterial mat-covered travertine chimneys constitute a great analogy to the suboceanic "black smoker" formations which are believed to be the primordial environment where life has emerged. Travertines also form in successive terrace morphology and rift/ridge morphology. Successive travertine terraces can be considered geological records of the territory's seismic activity; the rifts/ /ridges indicate fault/fracture related geothermal dynamics. Hisaralan geothermal travertine field is a rare and outstanding natural monument to be protected. It hosts excellent visual appeal accompanied by a high educational and scientific value and geotourism potential. However, its actual value is not yet fully understood and appreciated. As a result, the site is subjected to severe threat in geothermal drilling and piping, greenhouse, and tourism facility construction. The results of this research will contribute to the proper utilization and effective conservation of the site. This research is based on GIS analyses including high precision CORS GNSS, Total Station, RTK Drone, and GeoSLAM LIDAR surveys for the on-ground formations and Electrical Resistivity Tomography (ERT) surveys and control drills to understand sub-ground geological settings. 15 parallel 2D ERT profiles with dense electrode spacings revealed out the fossil successive travertine terraces buried underground and active control of the geothermal input.

**Keywords:** Ida Madra Geopark, ERT, Travertine chimney, Travertine terrace, volcano-tectonics

**Corresponding author:** inan@hacettepe.edu.tr

**Reference:**

Brogi, A. and Capezzuoli, E., 2009. Travertine deposition and faulting: the fault-related travertine fissure-ridge at Terme S. Giovanni, Rapolano Terme (Italy). *Int J Earth Sci (Geol Rundsch)*, 98, 931–947 Ford, T.D. and Pedley, H.M., 1996. A review of tufa and travertine deposits of the world. *Earth-Science Reviews* 41, 117-175. Pentecost, A. and Viles, H., 1994. A Review and Reassessment of Travertine Classification. *Géographie physique et Quaternaire*, 48(3), 305–314. Aldanmaz E. et al., 2000. Petrogenetic Evolution of Late Cenozoic, Post-Collision Volcanism in Western Anatolia, Turkey. *Journal Volcanology and Geothermal Research* 102, 67-95. Bozkurt, E. and Mittweide, S.K., 2005. Introduction: Evolution of Continental Extensional Tectonics of Western Turkey. *Geodinamica Acta* 18(3-4), 153–165. Helvacı, C., 1995. Stratigraphy, Mineralogy, and Genesis of the Bigadiç Borate Deposits, Western Turkey. *Economic Geology* 90(5), 1237-1260. Helvacı, C. ve Alaca, O., 1991. Bigadiç Borat Yatakları ve Çevresinin Jeolojisi ve Mineralojisi. *Maden Tetkik ve Arama Dergisi*, 113(113).

## The Paleozoic Ichnofacies of Bagnoles de l'Orne (Normandy Maine Aspiring Geopark): a Study for their Integration within a Geological Nature Reserve

Jacques AVOINE<sup>1\*</sup>, Laura BAILLET<sup>2</sup>, Isabelle AUBRON<sup>3</sup>,

University of Caen Normandie<sup>1</sup> France, Association Patrimoine Géologique Normandie<sup>2</sup> France, PNR Normandie Maine<sup>3</sup> France

The Armorican Quartzite (Floian) is one of the most characteristic units of the W Europe Paleozoic, represented in the Lower Ordovician succession of Armorican Massif and over most of the Iberian Peninsula. The quartzitic reliefs form the heart of the Normandy Maine aspiring geopark, includes several synclines that shape the picturesque landscape. A multisites geological nature reserve was created in 2009 to protect the main geosites. Each of them must be studied in detail before being integrated into the geological reserve. High definition orthophotographs were taken on more or less altered bed surfaces from three slabs of Armorican Quartzite, to support detailed observations at the centimeter scale, completed by precise visual observations: identification and mapping of the different types of geological objects, measures, evaluation of their geological value and conservation state. Five different types of geological artifacts have been observed in parallel: geological formation (stratigraphy), rocks (petrology), sedimentary structures (sedimentology), tectonic structures (tectonics) and of course ichnofossils (paleontology). In each category, their geological interest, scale, type of object and illustration were provided. The geoheritage value of the different types of geological artifacts was calculated for the four general categories, geological formation, rocks, sedimentary and tectonic structures, then with four types of ichnofossils. The evaluation criteria are those used in the French geoheritage inventory: geological interest, educational interest, national rarity, rarity in the geosite. The three slabs have been the subject of a complete assessment relating to conservation issues, with three criteria: the type of fossil trace, their state of conservation and their readability. Finally, they have been included in the geological nature reserve to protect them as geosites of the aspiring geopark. This classification will facilitate new research and educational activities.

**Keywords:** Normandie-Maine, Armorican Quartzite, Cruziana, Rhuzophycus, Nature reserve

**Corresponding author:** avoinej@aol.com

**Reference:**

Avoine J, Baillet L. (2016) - Etude géologique des Pierres Plates de Bagnoles de l'Orne Normandie. Rap. APGN-01-2016, APN-PNRNM eds, 105 p.

## On the Fossil Footprints of the Luberon UNESCO Global Geopark: The Saignon Fossil Tracksite (Vaucluse, France)

*Pauline COSTER<sup>1\*</sup>, Stéphane LEGAL<sup>1</sup>,*

*Luberon Regional Nature Park – UNESCO Global Geopark<sup>1</sup> France, Luberon Regional NaturePark – UNESCO Global Geopark<sup>1</sup> France*

Trace fossils represent an important component of the Earth's heritage that provide keys for understanding the diversity and evolution of life and environments through time. Fossil tracks offer a source of information about the locomotion, behavior, anatomy, ecology and evolution of extinct animals that is not preserved in other types of fossil records. During the past decades, special attention has been paid to vertebrate ichnology, but most of studies concern Paleozoic and Mesozoic fossil traces. Footprints of Cenozoic mammals are rare. The Luberon Regional Nature Park – UNESCO Global Geopark, located in southeastern France, includes more than ten tracksites, making it one of the richest places in the field of tertiary ichnology. The Saignon tracksite, discovered in a quarry in the 1970's, has a very high density of footprints with thousands of mammal footprints and bird tracks preserved. It is located in the Apt syncline (Vaucluse, France) in the La Fayette limestone formation attributed to the early Oligocene. The site exhibits different kind of mammal tracks, including perissodactyl and artiodactyl footprints. Few years after its discovery, the site was buried under a protective cover made of multiple layers of geotextile, sand and gravels. This was intended to protect it from natural erosion processes due to rain and temperature variations as well as vegetation growth that were damaging the site. In 2020, the protective cover was removed with the help of local volunteers. A long-term conservation plan was developed. It includes the full documentation and 3D digital data capture of the site using photogrammetry, scientific investigation of the tracks, restoration, and the implementation of new in-situ conservation measures compatible with public access. The construction of a protective shelter with a low environmental impact is now under study. The building will protect the tracksite and will include a visitor walkway and educational interpretation trails. Rooftop solar panels will produce energy and provide environmental benefits. The Saignon fossil tracksite represent a rich and fragile geoheritage that requires special geoconservation measures. Through this project, the Luberon geopark promotes the valorization of its geological heritage while encouraging education, public awareness raising, geotourism and sustainable development.

**Keywords:** Luberon, Geopark, fossil, track, geoconservation

**Corresponding author:** pauline.coster@parcduluberon.fr

**Reference:**

## Systematic Literature Review of Geographic Information Systems Application on UNESCO Global Geopark

*Emmaline ROSADO-GONZÁLEZ<sup>1\*</sup>, José Manuel MARTINHO LOURENÇO<sup>1</sup>, Elizabeth SILVA<sup>1</sup>, Artur A. SÁ<sup>1</sup>,*

*Geosciences Centre (CGeo), University of Trás-os-Montese Alto Douro, UNESCO Chair on Geoparks, Sustainable Regional Development and Healthy Lifestyles<sup>1</sup> Portugal, Geosciences Centre(CGeo), University of Trás-os-Montese Alto Douro, UNESCO Chair on Geoparks, Sustainable Regional Development and Healthy Lifestyles<sup>1</sup> Portugal, Geosciences Centre(CGeo), University of Trás-os-Montese Alto Douro, UNESCO Chair on Geoparks, Sustainable Regional Development and Healthy Lifestyles<sup>1</sup> Portugal, Geosciences Centre(CGeo), University of Trás-os-Montese Alto Douro, UNESCO Chair on Geoparks, Sustainable Regional Development and Healthy Lifestyles<sup>1</sup> Portugal*

The UNESCO Global Geoparks (UGGps) are territories that promote Sustainable Development through a territorial management plan focused on education, conservation, and local development. On this scope, the use of Geographic Information Systems (GIS) could be an asset of universal use for the spatial planning required in the UGGps. Considering that the UGGps are a recent designation (2015), a systematic literature review (SLR) regarding the application of GIS in UGGps provides a baseline of opportunities on the actual and potential applications of GIS in the management plans and spatial planning processes of the territories designated as UGGps. The systematic literature review was on the following databases: Dimensions, RCAAP, Redalyc, SciELO, ScienceDirect, Scopus, Springer, and Web of Science (WoS). Between 2000 and 2020, were found 101 publications, and after the application of different selection criteria, 32 publications were selected for the SLR. After the initial review, different characteristics and attributes of these publications were identified and described such as the type and journal of publication, the year, the geographic location of the studied area, the main keywords and domain search areas, the language of publication, and the main methods and tools used for the spatial analysis or planning in the UGGps and Aspiring territories, depending on the study case. Was also found out that the countries with more developed work on these topics were Italy, Indonesia, and China, and the studies carried on regarding the UGGps and GIS were focused on land use, satellite data, and geomorphological mapping. This SLR allows concluding that this kind of studies are recent and still incipient, so the field of opportunities to apply the geographic technologies to UGGps had enormous and vast potential. In this sense, one of the main applications that can be implemented in UGGps for the improvement, adaptation, and actualization of the spatial planning and management of the territories is the application of participative mapping strategies. This allows understanding the dynamics, evolution, and transformation of the UGGps, and at the same time, identify the needs, issues, and requirements through community knowledge and citizen science.

**Keywords:** UNESCO Global Geoparks, Geographic Information Systems, Systematic Literature Review, GIS application, Geospatial information

**Corresponding author:** emmalineg@utad.pt

**Reference:**

Wegener, M. (1998) GIS and spatial planning. Environment and Planning B: Planning and Design Anniversary Issue, 1998, pages 48 - 52

## Mineral Resources In UNESCO Global Geoparks In Latin America And The Caribbean

*Helga CHULEPIN<sup>1\*</sup>, Denise GORFINKIEL<sup>2</sup>,*

*Consultant, UNESCO Montevideo, International Geoscience and Geoparks Program<sup>1</sup> Uruguay, International Geoscience and Geopark Program for Latin America and the Caribbean, UNESCO Montevideo<sup>2</sup> Uruguay*

How do UNESCO Global Geoparks relate to mineral resources? How are they integrated into sustainable development? The objective of this research was to understand the current situation of UNESCO Global Geoparks in Latin America and the Caribbean Region regarding mineral resources and, their relationship to sustainable development, Geoconservation, Geoeducation, Geotourism, Networking, communities, indigenous peoples, and the management of their territories. The first stage consisted of a survey to identify what types of Georesources each UNESCO Global Geoparks have, and to find out what are their uses and their relationship with the Geopark pillars. As well as collecting data about good practices on these matters. The participants in the survey were the UNESCO Global Geoparks in the Latin America and the Caribbean region, as well as the Aspiring Geoparks and Projects; a total of 27 territories from Brazil, Chile, Ecuador, Mexico, Nicaragua, Peru, and Uruguay. We share the main findings as all UNESCO Global Geoparks in LAC have Mineral Resources in their territories and all have been exploited at some point. Most of the Geoparks are not including this topic as potential assets to promote Geotourism, Geoeducation, and Geoconservation. All Geoparks express a strong willingness to continue working and receiving training on the management and proper use of mineral resources in their territories related to the activities of the UNESCO Global Geoparks. The good practices that are already applied in these territories are rescued, in order to value them and use them as a model. Do you want to share with us the relationship between your Geopark and Mineral Resources?

**Keywords:** Mineral Resources, UNESCO Global Geoparks Latin America and the Caribbean, Sustainable Development, Research, Georesources

**Corresponding author:** chulepinh@hotmail.com

**Reference:**

Published in 2020 by the United Nations Educational, Scientific and Cultural Organization, 7, place de Fontenoy, 75352 Paris 07 SP, France, and UNESCO's Regional Office for Sciences in Latin America and the Caribbean in Montevideo, Luis Piera 1992, piso 2, 11200, Montevideo, Uruguay.

## The Maiella UNESCO Global Geopark, a journey through its geodiversity and sustainable development research program

Adele GARZARELLA<sup>1\*</sup>,  
Ispra, Rome<sup>1</sup> Italy

The Maiella National Park (MNP) has been included in the UNESCO Global Geopark (UGGp) Network last April 2021. Its territory extends over three of the four Abruzzo provinces, and includes 39 municipalities, mainly mountain villages, that constitute a unicum in terms of human interaction with the landscape. In the Maiella UGGp area, 95 geosites have been identified, 22 of which are of international interest. The Maiella UGGp represents a territory with a particular geological heritage, dedicated to a sustainable development strategy, as such it can play an active role in the economic development of the territory. Sustainable tourism is growing year by year and can rely on a network of over twenty visitor centres, museums, and 1200km-long network of trails and mountain bike routes. The Maiella UGGp is characterized by a biodiversity heritage among the most significant in Europe, the variety of geomorphological landscapes characterizes habitats that are home to the most valuable part of Italian and European flora, as well as rare animal species such as the Marsica bear. The floral wealth of the Majella, in both quantitative (the high number of species present) and in qualitative terms (many endemic, rare, or endangered species) is the result of complex geologic and climatic events. Human agropastoral activities, conducted in the past in non-intensive ways, contributed notably to this patrimony, with the creation of new habitats and ecological niches. Maiella UGGp established in 2005 its own seed bank, together with the R.I.B.E.S. network (national network of 15 seed banks) focused on wild, rare or endemic species, which are threatened with extinction, and on native varieties. It aims the conservation of plant germplasm, as part of the in-situ conservation activities in the botanical gardens of the park or in the sites of farming designated keepers. The strong relationship between the landscape and humans led to preserve some varieties almost disappeared. Maiella UGGP is trying to recover them, being the link between the need to ensure environmental conservation and the natural, agricultural and food traditions, and the guarantee for sustainable development. The Maiella UGGp and the wine producers Cantina Orsogna, pursue a common project to select indigenous yeast strains from the mountain flora at different altitude ranges, in different bioclimatic zones. Once collected, the pollen is poured on sterilised must. After the subsequent multiplication of yeasts, the wine producers allow the grapes to ferment with indigenous yeasts. The result of this long and hard process is an organic biodiversity-certified wine.

**Keywords:** Maiella, Geopark, research, sustainable development, conservation

**Corresponding author:** adel.garzarella@gmail.com

**Reference:**

1. Conti F., Ciaschetti G., Di Martino L. & Bartolucci F. 2019. An annotated checklist of the vascular flora of the Majella National Park (Central Italy). *Phytotaxa* 412: 1-90.
2. Di Cecco V., Di Santo M., Di Musciano M., Manzi A., Di Cecco M., Ciaschetti G., Marcantonio G. & Di Martino L. 2020. The Majella National Park: a case study for the conservation of plant biodiversity in the Italian Apennines. *Italian Botanist* 10: 1–24. <https://doi.org/10.3897/italianbotanist.10.52952>
3. Di Martino L., Di Cecco V., Di Santo M., Di Cecco M., Ciaschetti G., Marcantonio G. & Frattaroli A.R. 2015. The Majella Seed Bank for the conservation of the endemic, rare or endangered species in Abruzzo: a tangible example of interaction between ex situ and in situ conservation. In: Mariotti M. & Magrini S. (Eds.), *Conservation of threatened species: activities and collaborations within the network*. RIBES Series 1: 49-52. 56 pp. ISBN: 978-88-940844-0-5
4. Di Martino L., Di Santo M. & Marcantonio G. 2020. Il patrimonio naturale e culturale dei Monti Pizzi, tra conservazione e opportunità di sviluppo sostenibile. *Rivista D'Abruzzo* n. 130, estate 2020. Edizioni Menabò, Ortona. pp X-XIV.
5. Di Santo M. & Di Cecco M. 2015. La Biodiversità agricola del Parco Nazionale della Majella. Il repertorio delle varietà autoctone. Litografia Botolini, Rocca San Giovanni (Ch).
6. Liberatoscioli E., Boscaino G., Agostini S., Garzarella A. & Patacca Scandone E. 2018. The Majella National Park aspiring UNESCO Geopark. *Geosciences* 2018, 8, 256; doi:10.3390/geosciences8070256.
7. Manzi A. 2020. I progenitori delle piante coltivate in Italia. I parenti selvatici dei vegetali in coltura per uso alimentare, il processo di domesticazione e la salvaguardia; Meta Edizioni: Treglio (Italy).
8. Zulli C., Manzi A. & Di Martino L. 2020. Nuove prospettive per la viticoltura dalla diversità microbiologica del territorio della Majella. *Rivista D'Abruzzo* n. 131 (allegato), autunno 2020. Edizioni Menabò, Ortona. pp 5-12.

## Geological landscapes and their formation and evolution of Wugongshan Geopark, China

Lichao YANG<sup>1\*</sup>, Meiyong HAO<sup>1</sup>, Fang REN<sup>1</sup>, Xia LI<sup>2</sup>, Qingcheng HE<sup>1</sup>,

*Chinese Academy of Geological Sciences, China<sup>1</sup> China, Chinese Academy of Geological Sciences, China<sup>1</sup> China, Chinese Academy of Geological Sciences, China<sup>1</sup> China, ChinaInstitute of Geo-Environment Monitoring<sup>2</sup> China, Chinese Academy of Geological Sciences, China China*

Wugongshan Geopark is located in the west of Jiangxi Province, China, with a total area of 1470.82 km<sup>2</sup>. The Geopark presents comprehensive geological and geomorphological landscapes controlled by the dome structure and characterized by the alpine meadow on granite weathering crust, granite peak forests, Z-shaped waterfall groups and the ring-shaped "hot springs chain". These geological landscapes are caused by the formation and evolution of Wugongshan. The Wugongshan is a massif which comprises granitic dome extensional structures and whose igneous nucleus is composed of Caledonian and Yanshanian granites. The Wugongshan granitic dome structures were formed from multiple collisions of the Yangtze plate and the Cathaysian plate, many strong magma diapiric emplacements and the crust locally uplifting greatly in Yanshanian Period. The dome structure of Wugongshan has 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 (> 1,600 m) on the top of the dome, granite peak forests (1,600-1,200 m) on the upper part of the dome, Z-shaped steep slope waterfall groups (1,200-500 m) in the middle of the dome, and the ring-shaped "hot springs chain" (< 500 m) around Wugongshan at the edge of the dome. The unique geological landscapes of Wugongshan Geopark have drawn worldwide attention and led to a growing number of visitors every year.

**Keywords:** Wugongshan Geopark, Dome structure, Alpine meadow, Waterfall groups, Hot spring chain

**Corresponding author:** y.lc@163.com

**Reference:**

[1] Wang D Z , Shu L S , Faure M , et al. Mesozoic magmatism and granitic dome in the Wugongshan Massif, Jiangxi province and their genetical relationship to the tectonic events in southeast China[J]. Tectonophysics, 2001, 339( 3–4):259-277. [2] Faure M, Sun Y, Shu L, et al. Extensional tectonics within a subduction-type orogen. The case study of the Wugongshan dome (Jiangxi Province, southeastern China)[J]. Tectonophysics, 1996, 263(1–4):77-106. [3] ZHANG Yongzhong, LIU Gaofeng, Wang Daoying. Landscape resources of granitic peak forest landform and their formation and evolution in the Wugong Mountain, Jiangxi[J]. Geological survey and research, 2019, 42(4):305-314 (in Chinese).

## Living Landscape in the Ruins of the Caledonides in the Fjord Coast Regional - and Geopark

Alice VIE<sup>1\*</sup>,

*Fjordkysten regional- og geopark<sup>1</sup> Norway*

Fjordkysten regional- og geopark (The Fjord Coast Regional- and Geopark) is located on the westernmost coast of Norway, where the mouth of the mighty Sognefjord meets the rough North Sea. The Park represents a geological diverse region that exhibits a unique window into the ancient Caledonian Mountain Chain (400 Ma), and the processes associated with its formation and subsequent destruction. Topographically, the Caledonides were comparable to the current Himalayan Mountain Range and a result of collision between the ancient continents Laurentia and Baltica. The Park is on the Baltic side and covers a portion of the Caledonides that hosts its most essential components, exposed through superb localities within a limited geographical region. Based on two key evidences found in the park this might be the best place on earth to study a mountain chain's rise and fall: 1) Multiple lenses of eclogite and deposits of kyanite-mica-schist represents the evidence of Baltica basement being subducted to great depth under Laurentia. 2) The extension of the crust under the collapse led to the formation of the world's largest shear zones, the Nordfjord-Sogn Detachment Zone. With simultaneous updoming of the crust, erosion of the mountains filled the "sliding" basins developed with up to more than 20 km thick deposits of Devonian conglomerate and sandstone. The collapse of the Caledonides created the Solund- and Kvamshesten Devonian Basin. These are "tough" rocks, resisting erosion better than surrounding rocks, implying that they now form some of the highest peaks in the park area. Millions of years with rifting, erosion, and the action of the last numerous ice ages resulted in a characteristic landscape of fjords and intricate archipelagos. After the deglaciation, settlers started to clear forest with axes, fire, and grazing animals. The resulting open landscape is called coastal heath. It is a type of habitat only found along the coast due to the mild climate that allows grazing animals to be kept outdoors all year round. These ancient farming traditions of back burning heather and roaming sheep had almost completely disappeared. But recently the locals have increased their understanding of how important the interaction between landscape and culture is in this region. They decided to extend the breeding of the Old Norwegian Sheep again. This traditional breed is genetically the same as the Vikings used a thousand years ago and is fully adapted to the natural coastal climate. The sheep produce sustainable meat and wool and manage the coastal heath landscape simultaneously. Burning back and grazing increases biodiversity and protects plants, birds and insects. When forest grows back, it becomes too dark and cold for certain parts of the vegetation to survive. To manage this cultural landscape encourages the growth of red listed warmth loving low plants and it prevents various flowers and insects from vanishing.

**Keywords:** Living landscape, Devonian basins, Caledonides, Fjord Coast, Norway

**Corresponding author:** [alice@fjordkystparken.no](mailto:alice@fjordkystparken.no)

**Reference:**

Trude Søylen, Alice Hestad Vie, Fjord Coast Regional- and Geopark, West Norway, Norway

## Napo Sumaco Aspiring UNESCO Global Geopark (Ecuador): Activities and Consolidation

*Jose Luis SANCHEZ CORTEZ<sup>1\*</sup>,  
University of Guayaquil<sup>1</sup> Ecuador*

The Napo Sumaco Aspiring UNESCO Global Geopark, was born from the academy, with the support of local government institutions and the active participation of the communities settled in this territory, which covers an area of 1,800 square kilometers, and involves two municipalities and close to 60 indigenous communities, which maintain a great diversity of cultural and traditional aspects, which characterize the territory of the Amazon Kichwa of the Napo Province. In April 2015, the Geotouristic Inventory of Natural Cavities in Napo Province project: Documentation of orality and related strategic resources, marked the beginning of the determination of the territory of the Napo Sumaco Geopark. From this inventory, we proceeded to catalog sites of geotouristic interest, of which 15 sites of geological interest stand out. These sites are great territorial elements that have a cultural affinity with the communities and form the base of the territory. Since February 2017, public hearings were held to socialize the initiative, with strong community participation, in the towns of Tena and Aguayaku respectively. The social reception was important and letters of support for the project were even signed. With that support, local guide courses "Pushak Runas", children's workshops, contests, techniques for cave exploration techniques, cave geology training for cave owners, training on conservation and use of karst, among other activities, have been organized. In October 2018, the Napo Sumaco Geopark organized in the city of Tena the II Ecuador Geoparks Meeting. In empowerment it has been evident, so much so that in April 2019 the Rumiñahui Community organized the activities for the celebration of the Latin American Geotourism Day, with about 200 local and national attendees.

**Keywords:** Napo Sumaco, Geotourism, Geoparks, Geoconservation

**Corresponding author:** jossancor@gmail.com

**Reference:**

Sánchez-Cortez, J.L.; Cárdenas-Pinto, V.; Ocampos-Valarezo, D.; Jaque-Bonilla, D.; Quilumba-Dután, D.; Ortiz-Barrionuevo, J.; Quinteros-Cevallos, R. A. & Toledo-Rojas, N. (2017). Aplicación de Proceso Metodológico para el Inventario Geoturístico de Cavidades Naturales en la Provincia de Napo – Ecuador. Anuário do Instituto de Geociências – UFRJ. Vol. 40 – 2 / 2017. 61 – 73. Sánchez Cortez, J. L. (Coord.) (2017). Guía Espeleológica de Napo. Gobierno Autónomo Descentralizado de Napo, Universidad Regional Amazónica IKIAM, Sociedad Científica Espeleológica Ecuatoriana (ECUCAVE), Geoparque Napo Sumaco. Tena, Ecuador.

## The aspiring UNESCO Global Geopark Mëllerdall, Grand-Duchy of Luxembourg

*Birgit KAUSCH<sup>1\*</sup>,*

*Natur- Geopark Mëllerdall<sup>1</sup> Luxembourg*

The aspiring UNESCO Global Geopark “Mëllerdall” is situated in Western Europe, in the Eastern part of the Grand-Duchy of Luxembourg. There, the Luxembourg Sandstone Formation of Lower Jurassic age forms one of the most spectacular sandstone landscapes in Western Europe. It comprises the central part of a small-scaled cuesta landscape, formed in a synclinal structure at the north-eastern rim of the Paris Basin. An abundance of sedimentary and weathering structures, geomorphological forms, witnesses of human habitation since the stone age (the Mëllerdall is an important archive for the early history of the country) and an unique natural heritage tell the history of this historically grown cultural landscape and its inhabitants. The park’s management structure is a recognized body under national legislation. The park was established in 2016 and includes 11 municipalities with a population of about 25,500. Its overall objective is the sustainable development of the region, which covers with an area of 256 km<sup>2</sup> about 1/10 of Luxembourg’s total area. Guiding themes, defined in a bottom up process, are the development and promotion of regional products and regional timber, self-sufficiency in drinking water, diversity of landscapes, transfer of knowledge and preserving the region for all creatures and inhabitants. Their implementation takes place through permanent services in various fields of expertise, as well as through temporary projects. They all are carried out in close cooperation with the region’s municipalities, residents and businesses. The region of the aspiring UGGp Mëllerdall is a rural area, where land use depends on topography and soil types. Natural resources like water and building stones have been exploited by man since early times. Today, the municipalities are nearly fully self-sufficient in their supply of drinking water, as the Luxembourg Sandstone has a long-term continuous discharge and excellent filtering capacities. The quality (as well as the quantity) of the water must be guaranteed in the long run, e.g. by the delineation of drinking water protection areas, bringing certain restrictions concerning land use. Meadow orchards are typical elements in the cultural landscape and are used to produce a variety of regional products. The geological, natural and historical heritage of the proposed Geopark is evident all over the region, especially in the 22 geosites related to geology and geomorphology, which are strengthened by a large number of educational, archaeological, historical and botanical sites, mostly connected by a network of well signposted hiking trails.

**Keywords:** aspiring Geopark, Grand-Duchy of Luxembourg, sustainable development, sandstone landscape

**Corresponding author:** birgit.kausch@naturpark-mellerdall.lu

**Reference:**

## THE INFLUENCE OF SALPAUSSELKÄ FORMATIONS ON THE SETTLEMENT IN THE REGION OF PÄIJÄT-HÄME

*Eeva AARREVAARA<sup>1\*</sup>,*

*LAB UNIVERSITY OF APPLIED SCIENCES<sup>1</sup> Finland*

The history of the Salpausselkä edge formations dates back to the sudden climate change during the younger Dryas age when the movement of the glacier in the Northern Europe stopped and the melting process created the formations in the present Päijät-Häme region. The landscape is at present dominated by the high forest covered formations which divide the region into different landscapes in southern and northern sides. The southern area has been covered by ancient lakes and seas which have created large clay layers, the area has also more rivers than lakes, while the northern area is dominated by lakes. Archeological research has found one of the oldest settlements in Finland next to River Porvoonjoki shore in the southern area of the formations, dating back from the early Mesolithic period app. 12,000 years ago. In early historical periods the importance of water courses was indisputable as a means for transportation, and they connected places of either temporary or permanent residences. Village sites mentioned in the documents in 1539 have been introduced in research report with their current situation and state. The map of the settlements in 1560's in Finland demonstrates that the biggest villages in the area located on lakeshores or on the low slopes of the edge formation or minor eskers. Together with pre historical findings they provide an overview of the settlement, even some remnants of the early roads connecting medieval castles are still visible. Closest castles were situated in the west, the Hämeen linna castle, and in the northeast, the Olavinlinna castle and also in the east, the Viipurinlinna castle. The historical road was situated partly on the first Salpausselkä formation. Along the road there were several medieval churches, most of which still exist. The old road was also detected in the recent excavations carried out in the market place in the city of Lahti together with remnants of the old village in 19th century. The major historical transitions in the area started when the first railway was built in late 1800's as a connection between the city of Riihimäki and the city of St Petersburg while Finland was an autonomous part of the Russian empire. The railway was situated on the edge formation due to the optimal ground for building. Similar thinking attracted growing villages and future towns to enlarge their domination near the Salpausselkä during later 19th and 20th centuries. The historical layers from the pre historical time in the area surrounding the first Salpausselkä edge formation are still possible to detect in the area. Considering the aspiring Salpausselkä geopark the archeology and cultural history provide a rich background which is still very limitedly utilised in public and is possible to add value to the regional geology based tourism.

**Keywords:** CULTURAL HERITAGE, EDGE FORMATION, SETTLEMENT, HISTORICAL ROAD, GEOPARK

**Corresponding author:** eeva.aarveaara@lab.fi

**Reference:**

Aarveaara, E. 2016. Maaseudun ja taajamien rakentaminen Salpausselkien alueella. Kaikkien aikojen Salpausselkä. Aarveaara, E., Komulainen, K., Carrol, P., & Salomäki, P. 2017. Towards a global geopark in Salpausselkä: The Salpausselkä Geopark Project continues. Well-being and Regenerative Growth Annual Review 2017.

## Scientific Interpretation of Longyan Aspiring Global Geopark, Fujian, China

Yuanyuan ZHENG<sup>1\*</sup>,

*Chinese Academy of Geological Sciences<sup>1</sup> China*

Longyan Aspiring Global Geopark is abundant with geoheritage resources covering an area of 2,175 km<sup>2</sup>, located in the southeastern China. The widespread multi-episode granite, late Cretaceous super-thick red-bed sedimentary rocks and typical Danxia landscape, and super-large porphyry-epithermal copper-gold deposit are the most significant geological features. The promotion of the geopark and acting as an educational function face many challenges. How to introduce the Longyan Geopark? One of practical choices is set up a scientific interpretation system to integrate outdoor and indoor facilities within the territory of the geopark. Now the scientific interpretation system is the main feature of our geopark. It includes outdoor facilities, indoor facilities, printed and electronic information, and tour guide team. The outdoor facilities contain three main tablets, more than a hundred interpretative panels, hiking routes and typical geological sections. Three museums, seven visitor centers and several information stations (kiosks) comprise the indoor interpretative facilities. A variety of paper and electronic materials include guide map, guidebook, geopark series and leaflets which can help tourists and local residents better understanding the territory of Longyan aUGGp. As to tour guides team, it covers local guides, manager of the geopark and supporting scientists. Cultivating local talents has always been the focus of geopark's creation.

**Keywords:** Longyan Geopark, scientific interpretation, outdoor facilities, indoor facilities

**Corresponding author:** zhengyuan8819@sina.com

**Reference:**



---

# DAY 3

December 16

---





## The 'World Research Travel Organization' - A Potential Partner Of UNESCO Global Geoparks

Zhenzhi YANG<sup>1</sup>, Wolfgang EDER<sup>2\*</sup>, Young NG<sup>3</sup>,  
*Univ. Chengdu<sup>1</sup> China, Univ. Goettingen<sup>2</sup> Germany, Geol. Soc. of Australia<sup>3</sup> Australia*

Exactly 25 years ago, at the INTERNATIONAL GEOLOGICAL CONGRESS, held 1996 in Beijing, a few visionaries in UNESCO, IUCN, IUGS and ProGEO started to think out loudly about an UNESCO umbrella with a special emphasis on the promotion and popularization of Earth Sciences. It was their feeling that – globally – the geosciences, did not get that part of public recognition that geosciences should earn, compared to ecology, economy, and environmental sciences at large. The base was laid for designing the frame for 'Geoparks' that integrate education of the public at large and sustainable economic development (through Geotourism) as well as environmental protection of selected areas. The 2019 established World Research Travel Organization (WRTO) is building upon elements of the Chinese-Canadian 'World Geo-Tourism Organisation' of 2014 and aims at 'Promoting Geotourism on a Global Scale' – by following J.W. von Goethe that "the best education of a clever man is travelling". Through building bridges between researchers, educators, policy makers, operators and managers of the travel industry WRTO is dedicated to establish a platform for communicating scientific and educational findings on 'Research Tourism'. By joint educational projects in travel or touristic affairs worldwide WRTO could serve as a partner of the Global Geoparks Network, IUGS-UNESCO's 'IGCP', UNESCO Chairs and UNESCO dedicated sites. Items like "Geoparks as Spreading Centres of Geo-knowledge", 'Standards in Sustainable Tourism' (C. Gleeson, Burren Geopark, Ireland) or 'Digital Capabilities of Tourism Organisations' (E. Silva, UNESCO Commission, Portugal) are of outstanding importance and would contribute to a better understanding, development and protection of the diversity of world's nature and culture. Despite the disruption brought about by the COVID-19 pandemic WRTO continues to provide support to the environmental, cultural, educational and social challenges of the modern world through envisaging synergies and cooperation with (inter)national educational entities and academic as well as (inter)governmental organizations, including travel institutions.

**Keywords:** Geotourism, Global Geoparks, Travel Research, Popularization of Earth and Natural Sciences

**Corresponding author:** yzz310@163.com, w.eder-geo@hotmail.de, weder@geo.uni-goettingen.de

**Reference:**

F. Wolfgang Eder, Past UNESCO Director 'Earth Sciences', Chairman 'WRTO' c/o GeoCentre, Univ. Goettingen, Germany; weder@geo.uni-goettingen.de

## How To Continue Longer Term Geopark Cooperation During Pandemic Time

*Tao HUANG<sup>1\*</sup>,  
Lushan UGGP<sup>1</sup> China*

Lushan UGGp actively participated in global geopark network activities. She participated various international and domestic geopark conferences and training, and carried out international and domestic cooperation and communication by holding various online and offline events. Lushan UGGp participated in the 8th International Conference on UNESCO Global Geoparks, the 8th Asia Pacific Geopark Network Symposium, APGN CC online Meeting, the 1st and 2nd GGN Digital Forums. Lushan UGGp has also sent promotional videos of Lushan UGGp for the 1st Global Geopark Network Film Festival, participated in every International Training Course on UNESCO Global Geoparks Management and Development, and in the 2nd Digital Course on UNESCO Global Geoparks, UNESCO GLOBAL GEOPARKS and SUSTAINABILITY. Since 2018, Lushan UGGp has established cooperation with a number of sister geoparks: with 6 UGGps(Rinjani Lombok UGGp, Batur UGGp, Novohrad-Nógrád UGGp, Zhangye UGGp, Dali-Cangshan UGGp, and Yimengshan UGGp). Delegations from Novohrad-Nógrád UGGp and Dali-Cangshan UGGp visited Lushan UGGp. In 2020 and 2021, Lushan UGGp participated in the online 1st and 2nd Indonesia Geo-tourism Festivals and Webinars hosted by Rinjani Lombok UGGp. Lushan and Rinjani Lombok UGGp co-hosted joint events of 2020 International Day of Disaster Risk Reduction. In 2021, Lushan UGGp and Bergstrasse-Odenwald UGGp co-hosted mutual promotion activities in Germany and China. Lushan UGGp also participated in the unveiling opening events of Zhangye UGGp and Yimengshan UGGp, and online webinar hosted by Malaysia's Langkawi UGGp. In 2019, Lushan UGGp hosted a Global Geoparks Photography Exhibition, which exhibited photography works from 42 global geoparks in 21 countries. In 2020 and 2021, Lushan co-hosted the joint events of common exhibition and promotion of Partner UGGps of the 1st and 2nd Earth Day APGN Geoparks Week with 12 UGGps and 25 UGGps respectively.

**Keywords:** Lushan, Geopark, Long, Cooperation, Pandemic

**Corresponding author:** lsht0321@foxmail.com

**Reference:**

Working Report of Lushan UGGp

## Geoparks Youth Hub: A Digital Platform to Connect Youth Globally for Geopark Sustainability

*Kaisar AKHIR<sup>1</sup>, Togu PARDEDE<sup>2\*</sup>, Immanuel Deo Juvente Hasian SILALAH<sup>3</sup>, Muhammad PRAVDA<sup>1</sup>, Indonesian Maritime Youths (Maritim Muda)<sup>1</sup> Indonesia, Ministry of National Development Planning / National Development Planning Agency of Republic of Indonesia<sup>2</sup> Indonesia, Indonesia Geopark Youth Forum<sup>3</sup> Indonesia, Indonesian Maritime Youths (Maritim Muda)<sup>1</sup> Indonesia*

At present, there are 169 UNESCO Global Geoparks in 44 countries. Pentahelix concept is one of the fundamental aspects in the development geoparks, where Youth existence is included on it. With the advancement of digital technology, global meeting, information exchange and event hosting by far will be more efficient with youth as the key person to utilize it. Therefore, this work aims to develop a digital web-based platform to connect youth within geoparks around the world for sustaining the geoparks altogether. The platform provides a digital communication portal for Geopark youth across countries. It also provides collective information of Geopark youth activities, events, and job vacancies across the geoparks. Conservation, education, and sustainable community economic development on geo-bio-cultural-diversity is the main topic to be shown as well in this platform. Finally, through this platform, Geopark youth can be supported to apply their roles as the agent of change, innovator, and collaborator within their geopark and across geoparks, nationally and internationally. Moreover, any fresh news about Geoparks can be also real-time published, conclusively help the youth and geopark communities communicate and connected in one-single platform.

**Keywords:** collaborative information, connected youth, geoparks youth, sustainable geoparks, web-based platform

**Corresponding author:** kaisarakhir@gmail.com

**Reference:**

[1] Global Geoparks Network. (2021). GGN Institutional Members. [https://globalgeoparksnetwork.org/?page\\_id=83](https://globalgeoparksnetwork.org/?page_id=83) [2] Luthfia, A., Wibowo, D., Widyakusumastuti, M. A., & Angeline, M. (2021). The role of digital literacy on online opportunity and online risk in Indonesian youth. *Asian Journal for Public Opinion Research*, 9(2), 142–160. <https://doi.org/10.15206/AJPOR.2021.9.2.142>. [3] Martinovic, D., Freiman, V., Lekule, C., Yang, Y. (2019). The roles of digital literacy in social life of youth. In M. Koshrow-Pour (Ed.). *Advanced methodologies and technologies in library science, information management, and scholarly inquiry* (pp. 103-117). IGI Global. doi: 10.4018/978-1-5225-7659-4.ch009 [4] Presidential Regulation of Republic of Indonesia No. 9 of 2019 on Geopark Development.

## The Spirit of 'Gotong Royong' for Youth in Developing Indonesian Geopark

*Eli Jamilah MIHARDJA<sup>1\*</sup>, Aditia Batara GUNAWAN<sup>1</sup>, Ari KURNIA<sup>1</sup>,  
Universitas Bakrie<sup>1</sup> Indonesia, Universitas Bakrie<sup>1</sup> Indonesia, Universitas Bakrie<sup>1</sup> Indonesia*

Gotong royong is a philosophy and practice in life as a noble heritage from the ancestors of the Indonesian nation. Today, the spirit of gotong royong should be preserved and practiced by the youth. This spirit of inheritance must also exist in an effort to maintain Indonesia's rich and amazing natural heritage, such as maintaining and maintaining geoparks in Indonesia. Research and community development activities carried out by the Pusat Studi Geopark at Universitas Bakrie University with the support of the Gerakan Nasional Revolusi Mental (National Mental Revolution Movement) from the Ministry of Human Development and Culture and the Indonesian Chancellor's Forum implement this concept of gotong royong in the current activities of Geopark Youth in Indonesia. Data were collected through literature studies, webinars, and field observations to formulate the implementation of the concept of gotong royong in real and empirical action. The activity was carried out for three months in Jakarta and Batur UNESCO Global Geopark in Bali. The data is studied using sociological concepts to describe the knowledge, attitudes, and actions which will be a benefit for maintaining geoparks in Indonesia. The results of the study show that there is great potential to fuse the concept of gotong royong in the everyday world of teenagers; no longer in the form of a conceptual campaign but rather moving together with popular culture media. Therefore, especially in Indonesia, ideological drafters need to further explore strategies for conveying ideas to young people who will later carry the noble values of the nation as their identity.

**Keywords:** Youth of Indonesian Geopark, GNRM, Gotong Royong, Social Cohesion, Geopark Regional Collaboration

**Corresponding author:** eli.mihardja@bakrie.ac.id

**Reference:**

Irfan, M. (2017). Metamorfosis gotong royong dalam pandangan konstruksi sosial. *Prosiding Penelitian dan Pengabdian kepada Masyarakat*, 4(1), 1-10. Network, G. G. (2020). What is a UNESCO Global Geopark. Rosyidie, A., Sagala, S., Syahbid, M. M., & Sasongko, M. A. (2018, May). The Current Observation and Challenges of Tourism Development in Batur Global Geopark Area, Bali Province, Indonesia. In *IOP Conference Series: Earth and Environmental Science* (Vol. 158, No. 1, p. 012033). IOP Publishing. Easterly, W., Ritzen, J., & Woolcock, M. (2006). Social cohesion, institutions, and growth. Center for Global Development Working Paper, (94). Jenson, J. (2010). Defining and measuring social cohesion (No. 1). Commonwealth Secretariat. Sagala, S., Rosyidie, A., Sasongko, M. A., & Syahbid, M. M. (2018, May). Who gets the benefits of geopark establishment? A study of Batur Geopark Area, Bali Province, Indonesia. In *IOP Conference Series: Earth and Environmental Science* (Vol. 158, No. 1, p. 012034). IOP Publishing.

## Progress and Challenges of the Geoparks Network of Latin America and the Caribbean GEOLAC. Strengthening the construction of way for sustainability and inclusion in Latin America and the Caribbean

*José Patricio Pereira MELO<sup>1\*</sup>,  
GEOPARK ARARIPE UGG<sup>1</sup> Brazil*

Progress and Challenges of the Geoparks Network of Latin America and the Caribbean GEOLAC. Strengthening the construction of way for sustainability and inclusion in Latin America and the Caribbean. José Patricio Pereira Melo 1 (GEOLAC Coordinator. Member of the exb from GGN), Eugenio Bidondo 2, Patricia Herrera 3, José Luis Palacio 4, Carlos Merizalde 5 The GEOLAC Network was founded on May 26, 2017, in the District of Achoma, Peru. The founding countries were Brazil, Uruguay and Mexico. By 2021, GEOLAC is made up of eight Geoparks, Araripe from Brazil, Mixteca Alta and Comarca Minera de México, Grutas de Palacio from Uruguay, Imbabura from Ecuador, Colca y Volcanes and Andagua from Peru, Rio Coco from Nicaragua and Kütralkura from Chile. Since its foundation, GEOLAC has placed emphasis on building and strengthening the institutional framework of the network from principles and values whose frame of reference are the Sustainable Development Goals (SDG) as pillars of the long-term strategic agenda. During the last two years, in a context of global health emergency due to COVID19, GEOLAC has made a commitment to advance in a participatory planning work, in which it is conceived that planning is not only a technical but also a political exercise and in this political sense associated with the relevance of the GEOLAC Network as an actor in the definition of common development policies in the Geoparks of Latin America and the Caribbean that allow generating shared vision, guidelines and strategic objectives that guide the actions of accredited Global Geoparks and those that come in the process of being. Existing, aspiring geoparks and projects. GEOLAC's planning is based on strategic guidelines that have made it possible to define three working groups (Gender, Indigenous Peoples, Education) and two transversal groups as support strategies for the dissemination and promotion of good practices, the Permanent Seminar on Geoparks of LAC and the Working Group (GENDER, INDIGENOUS PEOPLE) linked to the magazine Geovivencias; All of them linked to the goals of the SDGs and to the challenges that as geoparks of a region have in relation to the geo-heritage, biodiversity and the living culture of the native peoples settled in their territories. since the native peoples have a strong bond with Mother Earth. In relation to the progress of the working groups, two of them have a Strategic Plan, which has allowed generating, with the support of the PIGG Geosciences and Geoparks Program for Latin America, to generate a rich exchange from the trajectory and worldview of the actors themselves that reside in the territories of the Geoparks of Latin America. The Network aims to continue strengthening the work from the principles of Geoparks, planning "from below", with active participation of those who lead processes in the territories, and also improve Knowledge Management in the Network itself and with the others regional networks.

**Keywords:** Geoparks, GEOLAC Network, Planning, Sustainable development, Working Groups

**Corresponding author:** patricio.melo@urca.br

**Reference:**

1 GEOLAC Coordinator. Member of the exb from GGN. Culture Coordinator from Araripe UGG. patricio.melo@urca.br 2 Vice Coordenador from GEOLAC. Coordinator member from Grutas del Palacio UGG. 3 General SEcretary from GEOLAC. Coordinator member from Kultralkura UGG. 4 Vogal Member from GEOLAC. Scientific Staf from Mixteca Alta UGG. 5 Financial Member from GEOLAC. Coordinator member from Imbabura UGG.

## How Global Geoparks Can Support Decolonization and Raise Indigenous Voices: Lessons from the Canadian Experience

*Sarah BEHN<sup>1\*</sup>, John CALDER<sup>1</sup>,  
Canadian Geoparks Network<sup>1</sup> Canada, Canadian Geoparks Network<sup>1</sup> Canada*

It may seem to be counter-intuitive for a program born in Europe to be used as a pathway to the decolonization of countries and whole continents, but UNESCO Global Geoparks are forging that path. Such work begins at the grassroots level; Indigenous communities benefit from, and may require support from, allies and agencies. There is opportunity for mutual and symbiotic support and knowledge sharing between UNESCO Global Geoparks and Indigenous communities – the concept of “Two Eyed Seeing”. Canada is going through a period of growth as a country, facing its past and indeed current treatment of indigenous peoples. The road to reconciliation is a long one that requires great resources, commitment and change of heart among Canadians. While we acknowledge that UNESCO Global Geoparks cannot themselves bring about all changes required, they can serve as a model of inclusion and decolonization that raises voices and knowledge of Indigenous peoples.

**Keywords:** Indigenous, decolonization, reconciliation, empowerment, Canada

**Corresponding author:** behn.sea@gmail.com

**Reference:**

Behn, S. and Calder, J. 2021. How Global Geoparks Can Support Decolonization and Raise Indigenous Voices: Lessons from the Canadian Experience. 9th International Conference on UNESCO Global Geoparks, JeJu.

## Ecuadorian Committee of Geoparks (CEG): Path Toward the Conservation and Sustainable Use of the Geological Heritage of Ecuador

*Jose Luis SANCHEZ CORTEZ<sup>1\*</sup>,  
University of Guayaquil<sup>1</sup> Ecuador*

Due to the great geodiversity of Ecuador, it is not easy to present specific criteria related to the measures and scope of the conservation of geo-heritage in this nation; However, despite what one might believe, geoconservation in Ecuador is a pending issue, but not forgotten. Has been tried make the most of the tools available for geoconservation, because in Ecuador, there are a number of initiatives with a broad impact on tourism and local development, based on geological elements; These initiatives range from conservation areas to public and private initiatives. On the other hand, geoparks are playing an important role in this dynamic, for which it seeks to strengthen at the institutional and territorial level, due to the scope and coordination capacity that these management structures can establish. Thanks to the articulation of Geoparks Projects, UNESCO, government institutions and many Universities, as of February 2019, Ecuador has an Ecuadorian Committee of Geoparks (CEG), framed in the Guidelines for UNESCO Geoparks. There are strong limitations for the holistic development of geoheritage in Ecuador, however the formation of the CEG marks a milestone that seeks to strengthen the territories with interests in generating geoparks, being a support and management entity before government institutions.

**Keywords:** Ecuador, UNESCO Global Geoparks, Geoconservation, Geoheritage

**Corresponding author:** jossancor@gmail.com

**Reference:**

Sánchez-Cortez, J.L. (2019). Conservation of geoheritage in Ecuador: Situation and perspectives. *International Journal of Geoheritage and Parks*. Volume 7, Issue 2, 91-101.

## Bergstrasse-Odenwald UNESCO Global Geopark (Germany): Cooperation inside the territory and across the continents under pandemic conditions – examples and experiences

*Jutta WEBER<sup>1\*</sup>,  
Managing Director<sup>1</sup> Germany*

In these times, where travelling and personal meetings are restricted, we are asked to develop creative options for cooperation – inside our regions as well as international. In this context, Bergstrasse-Odenwald UNESCO Global Geopark has created a series of new formats, which include digital options as well as personal participation opportunities. Inside the Geopark, an interactive learning and adventure website platform was created, which combines digital information with visits in nature. A series of videos, which we have produced with partners enabled us to open a Geopark Youtube Channel. In addition, special equipped Ranger information booths at Geopark parking areas offered information materials and advice to hikers and bikers, which was highly appreciated. Inside the Global Geoparks Network (GGN), we have strengthened our bonds with longstanding partners by common projects: Together with Mt. Lushan UNESCO Global Geopark (China), we developed a photo exhibition titled “West-East Impressions”. A series of 40 extraordinary landscape photos of both Geoparks, overview maps, brochures and a documentation of our longstanding cooperation was exhibited at the Lorsch Museum Centre. Opened digitally and simultaneously in both Geoparks, a video and a 3D tour were available during lockdown. Afterwards, the exhibition could be visited personally until August 2021. Both Geoparks consider this exchange as an extraordinary chance for cooperation and support. We also continued our partnership with Lesvos UNESCO Global Geopark (Greece) and UNESCO WHS Messel Pit (northern Geopark Entrance), both also longstanding partners. Under the title “Understanding Climate Change. Exploring the consequences in the geological record of the Petrified Forest of Lesvos”, a joint exhibition was opened in July 2021 in the WHS Visitor Centre. Exhibition visitors experience, how dramatic the world of Lesvos changed after the Vatousa volcanic eruption 19 million years ago. The remains, especially numerous lithified tree trunks, give us an impression about the consequences of climate change in the Earth's history. The exhibition in the WHS Visitor Centre is open until 20th May 2022. The continuous cooperation inside the GGN fosters the overall holistic approach of UNESCO Global Geoparks: learning from our past, supporting each other in the present and serving for a livable future on our planet Earth.

**Keywords:** Bergstrasse-Odenwald UNESCO Global Geopark, digital formats, photo exhibition, climate exhibition, holistic approach, livable future

**Corresponding author:** j.weber@geo-naturpark.de

**Reference:**

## GEOfood as an Education, Research and Tourism Initiative

Sara GENTILINI<sup>1\*</sup>, Pål THJØMØE<sup>1</sup>, Joana RODRIGUES<sup>2</sup>, Alexandra PAZ<sup>3</sup>, Sophie JUSTICE<sup>4</sup>,

Magma Geopark<sup>1</sup> Norway, Magma Geopark<sup>1</sup> Norway, Naturtejo Geopark<sup>2</sup> Portugal, Arouca Geopark<sup>3</sup> Portugal, Chablais Geopark<sup>4</sup> France

GEOfood is an international initiative lead by Magma UNESCO Global Geopark, Norway, that includes three main fields of actions: tourism and valorization of geoheritage, education and research. The initiative addresses UNESCO Global Geoparks food enterprises and local communities with the general mission to promote the connection between the geodiversity of UNESCO Global Geoparks (UGGps) and local communities, encouraging local, quality and sustainable food through educational activities, research and promotion ([www.geofood.no/](http://www.geofood.no/)). The initiative encompasses many actions related to several Sustainable Development Goals (SDGs) of the United Nations Agenda 2030, as expressed in the GEOfood Manifesto of values. Educational, research and promotional activities are all based on fostering the responsible use of natural resources, with the goal of reducing food impact on CO2 global emissions. Supporting local farmers activities allows UNESCO Global Geoparks to strengthen the bottom-up approach in terms of community engagement and the common mission of influencing local, regional, and national policies towards innovative food systems and territorial planning which can strengthen urban-rural linkages and support local economies in UGGps. GEOfood is working to improve food education and encouraging the responsible use of resources by young people and supporting teachers in developing tailored courses. Currently the GEOfood initiative is being applied in 27 UGGps, in 19 countries, working with more than 100 local, small and medium-sized enterprises between restaurants, farmers and schools. Concerning the research aspect of the initiative, the UNESCO International Geosciences Programme (IGCP) approved the research project "GEOfood for the Sustainable Development in UNESCO Global Geoparks (IGCP 726)", to be conducted between 2021 and 2026, coordinated by Magma UGGp. The main goal of the IGCP 726 project, under the theme 'Geological Heritage for Sustainable Development' is to study the link between geological heritage, geodiversity, ecosystem services, food production, and sustainable development, allowing for the establishment of methodologies, procedures, guidelines and resources for the extended implementation of GEOfood. The in-depth analysis of these relationships is essential to understand the local identity of UGGps in all their cultural, social and economic aspects (use of natural-geological resources). This research will be used as a basis for developing strategies to fulfill the IGCP broad objective: to increase the understanding of geological processes and concepts of global importance, including an emphasis on socially relevant issues. The project team includes 45 partners from 26 countries: researchers from several UNESCO Global Geoparks, Universities, Museums, Geological Surveys, scientist and involves all GEOfood members and partners. Of the 18 applications approved, GEOfood received the IGCP Council's "Special Award" due to its recognised relevance.

**Keywords:** Geoparks, Education, Food, Research, Sustainability

**Corresponding author:** [sara@magmageopark.com](mailto:sara@magmageopark.com)

**Reference:**

Gentilini S, Thjømøe P. 2014, LOCAL FOOD CERTIFICATIONS IN GEOPARKS, Rokua European Conference Conference Proceeding, 2015. Geoproducts – Innovative development strategies in UNESCO Geoparks: Concept, implementation methodology, and case studies from Naturtejo Global Geopark, Portugal, in: International Journal of Geoheritage and Parks, Volume 9, Issue 1, March 2021, Pages 108-128 Joana Rodrigues et alia. S. Gentilini, C. Skogen, P. Thjømøe, The GEOfood brand: Local and international cooperation, European Geoparks Network Magazine, 17 (2020), p. 26 S. Gentilini, P. Thjømøe Engaging local food SME's Paper presented at the 7th International Conference on UNESCO Global Geoparks, English Riviera UNESCO Global Geopark (2016)

## Geopark Networking and Collaboration and COVID-19

*Sigurður SIGURSVEINSSON<sup>1\*</sup>,  
Katla UNESCO Global Geopark<sup>1</sup> Iceland*

The still ongoing COVID-19 pandemic has greatly affected the previously established ways of networking in the geopark family, both on a regional and global scale. In this presentation an attempt will be made to give an overview of the growth of the geopark family, mainly from an European perspective, how the structure of the face to face meetings has developed, and the measures taken to deal with the pandemic challenges for the network structure. In just over twenty years the European network has grown from a handful to almost 100, but the meeting system structure has remained more or less the same involving two meetings a year for the decision making body of the Coordination committee (CC). The Advisory committee (AC) meetings are held in conjunction with the CC meetings plus more meetings if necessary. The structure of the AC has remained stable over the years with about 13 members, but the CC is constantly growing as there are two representatives for each geopark. When the site designation list of UNESCO Global Geoparks was adopted by UNESCO in 2015 the task of evaluating new applications and revalidation reports was removed from the AC and CC to the UNESCO Global Geoparks Council. This gave an opportunity for creating space in the CC meeting agenda for meetings of different Working Groups. In 2019 there was a survey made among the CC members about how to increase productivity and interaction between delegates at the CC meetings. The plan was to discuss the findings at the EGN-CC meeting in March 2020. Because of the pandemic no physical meetings have been held in the EGN network in 2020 and 2021, but instead there have been five digital EGN-CC meetings, two in 2020 and three in 2021. The findings of the EGN survey in 2019 have not been discussed at the digital meetings but hopefully they will be on the agenda for the March 2022 meeting in Hondsrug/TERRA.vita, pending the status of the pandemic. During the pandemic the GGN has held two digital forums with the institutional members, one in 2020 and one in 2021. This experience of digital meetings, both on a regional as well as a global basis has given important lessons as to how such meetings can complement face to face meetings, rather than replace them. With increasing awareness of global warming it is important for the geopark family to identify ways to reduce long distance travelling and find new and innovative ways of networking in an increasingly connected world.

**Keywords:** COVID-19, Digital meetings, Coordination committee, Global warming

**Corresponding author:** sigurdur@hfsu.is

**Reference:**

[www.katlageopark.is](http://www.katlageopark.is)

## The value of partnerships in UNESCO Global Geoparks of Latin America and Caribbean: supporting the Sustainable Development Goals

*Emmaline ROSADO-GONZÁLEZ<sup>1\*</sup>, José Luis PALACIO-PRIETO<sup>2</sup>, Artur A. SÁ<sup>1</sup>,*

*Geoscience Centre (CGeo), University of Trás-os-Montes e Alto Douro, UNESCO Chair on Geoparks, Sustainable Regional Development and Healthy Lifestyles<sup>1</sup> Portugal, Earth Sciences School and Geography Institute, UNAM<sup>2</sup> Mexico, Geoscience Centre (CGeo), University of Trás-os-Montes e Alto Douro, UNESCO Chair on Geoparks, Sustainable Regional Development and Healthy Lifestyles<sup>1</sup> Portugal*

The partnerships are one of the main pillars for successful UNESCO Global Geoparks (UGGps), which promotes holistic management for the conservation of natural and cultural heritage, based on landscapes of international geological significance through education and tourism. In this sense, the UGGps are built on networks of partners at local, regional, and international levels, sharing and promoting ideas, experiences, knowledge, resources, products, and capacity building, among others. This sharing is possible because the UGGps are organized under a cohesive structure: the Global Geoparks Network (GGN) composed of 169 territories in 44 countries (2021). The GGN allows and supports the international exchange between all these distinguished areas. The GGN is composed of regional networks: European Geoparks Network (EGN), Asian-Pacific Geoparks Network (APGN); Latin America and Caribbean Geoparks Network (GeoLAC), and the African UNESCO Geoparks Network (AUGGN). The UNESCO Global Geoparks assumed the compromise to contribute to Sustainable Development Goals (SDGs). Considering this, each UGGp defines and implements a territorial management plan based on networking and partnerships among local governments, official institutions of education, environment agencies and NGOs, universities, stakeholders, farmers, service providers, tourism agents, among others, which support and promotes the local sustainable development. Regarding the GeoLAC reality, in 2018 was carried on a research on four territories: Araripe UGGp (Brazil), Grutas del Palacio UGGp (Uruguay), Comarca Minera UGGp, and Mixteca Alta UGGp (both in México). This research was based on knowing through the perception of their inhabitants how these territories have been worked on different initiatives for the local sustainable development and identify these actions under the scope of contribution to the SDGs. After the analysis of the obtained data, was identified that SDG 17 was one of the ones that achieve the greatest contribution in the four territories. This is because the partnerships are one of the fundamental guidelines for the UGGps, and these four territories in different ways make their efforts to create the local, regional, and international networks of partnerships, allowing them also to contribute to several other SDGs, particularly the SDGs 2, 4, 5, 8, 12 and 16. With this research was possible to conclude that these four territories, through their internal and external networks of partners, we're able to develop strategies, programs, initiatives, and projects that support, promote, and contribute to many of the SDGs, helping to improve the territorial sustainable development.

**Keywords:** UNESCO Global Geoparks, Latin America and Caribbean, Sustainable Development Goals, Partnerships for the Goals, 2030 Agenda

**Corresponding author:** emmalineg@utad.pt

**Reference:**

Rosado-González, E. M., Sá, A., Palacio-Prieto, J. L. (2020) UNESCO Global Geoparks in Latin America and the Caribbean and Their Contribution to Agenda 2030 Sustainable Development Goals. *Geoheritage* <https://doi.org/10.1007/s12371-020-00459-2>

## Stone Made Objects – The Traveling Exhibition to Promote Intangible Heritage of UNESCO Global Geoparks

*Alexandru ANDRASANU<sup>1\*</sup>, Konny KOOB<sup>2</sup>, Adina POPA<sup>1</sup>,*

*Hateg Country UNESCO Global Geopark / University of Bucharest<sup>1</sup> Romania, Aspiring Natur-Geopark Möllerdall<sup>2</sup>  
Luxembourg, Hateg Country UNESCO Global Geopark / University of Bucharest<sup>1</sup> Romania*

A fascinating way to express local geodiversity and its role in shaping local identity is to uncover and tell the stories of objects made from materials from the Earth's crust. Most of the objects surrounding us - either valuable or everyday items - use rocks and minerals as their raw materials. The relationship between the raw material and the object has been the manifestation of the Human-Earth dialogue revealing many stories. The first one is a geological story about how natural processes have generated specific rocks. Millions or hundreds of millions of years passed from the formation of the raw material until the moment when people turned it into an object. The second one is an anthropological story helping to create a sense of place and unique identity. This is the story of how local communities have used geological resources to create objects for use or ornamentation. The third one is about the impact the object production has generated on local economy or culture or, in some cases even globally. Based on the idea of one of the authors (AA) and with the support of the Intangible Heritage EGN Working Group and the GGN an exhibition of stone made objects opened for the first time in Adamello Brenta UGGp, in 2018. Managed by the Hateg Country UGGp the exhibition has become a travelling one, being then organized in Romania in 2019 and in Swabian Alb UGGp, Germany in 2019. This exhibition of the stories of our use of stone, and of the geological heritage behind it, comes from more than 30 European Geoparks. It relates how human creativity has turned geological materials into a cultural practice or a local or international industry, with socio-economic impact. It highlights how these practices and industries developed, faded and died, or are still alive in a new socio-economic context. This year the exhibition has arrived in Luxembourg and was extended by 11 objects from the Aspiring Natur- & Geopark Möllerdall, so that one exhibit from each member municipality. In addition, the geopark team translated the entire exhibition into German and French to make it accessible to a wider audience. The exhibition was shown at two different locations from May to July. First it was shown at the Trifolion in Echternach, known as the oldest town in Luxembourg where the exhibition was ceremoniously opened as part of the EGN Geopark Week. The next stage of the exhibition was in Larochette in a fairy-tale castle. The Stone Made objects exhibition and the regional additions were very well received by the public. People were enthusiastic about the many different objects from different geoparks and the UNESCO Global Geoparks thus became even more tangible for them. They were particularly proud that objects from Luxembourg are now part of the exhibition and will continue to travel to other geoparks in the future. What further stories might be told from the UNESCO Global Geoparks if more of them will told their stories of the use of stone!

**Keywords:** Intangible heritage, Stone made objects, Exhibition, Romania, Luxembourg

**Corresponding author:** alexandru.andrasanu@unibuc.ro

**Reference:**

Andrasanu, A. 2019. Stone made objects: A traveling exhibition and virtual vault to promote intangible heritage of UNESCO Global Geoparks. in European Geoparks Network Magazine, no 16, pp 8 - 9

## The Success Of Huanggang Dabieshan UNESCO Global Geopark And The Challenges It faces

Di WU<sup>1\*</sup>, Jiangfeng LI<sup>1</sup>,

China University of Geosciences(Wuhan)<sup>1</sup> China, China University of Geosciences(Wuhan)<sup>1</sup> China

Huanggang Dabieshan UNESCO Global Geopark is located in Huanggang city, Hubei Province, The People's Republic of China. It is a science park featuring continental orogenic belt, granite landform and subtropical forest ecological landscape, integrating earth exploration, environmental protection and tourism. After more than 10 years of construction and conservation by the local government and the community, the geopark was officially approved as a UNESCO Global Geopark on April 17, 2018. As one of only two UNESCO Global Geopark in Hubei Province, its success is of great significance. We will introduce the situation of Huanggang Dabieshan UNESCO Global Geopark, share its successful experience, describe its positive impact on local communities, and analyze its challenges and difficulties in order to provide inspiration for the construction and protection of other geoparks.

**Keywords:** Geopark, UNESCO Global Geopark, Huanggang Dabieshan

**Corresponding author:** wd0511@cug.edu.cn

**Reference:**

- [1] Petrological and zircon evidence for the Early Cretaceous granulite-facies metamorphism in the Dabie orogen, China[J]. Xiao-Ying Gao, Qiang-Qiang Zhang, Yong-Fei Zheng, Yi-Xiang Chen. LITHOS. 2017 [2] A brief analysis of geological hazard formation conditions and protection countermeasures in Huanggang Dabie Mountain World Geopark [J]. Deng Lihuan, Zou Fenghui. Western Resources. 2020(01) [3] Tourism Development of Huanggang Dabie Mountain World Geopark based on Unp analysis [J]. Deng Lihuan, Zou Fenghui. Resources, Environment and Engineering. 2020(01) [4] Li Jia-wei, Pei Shun-ping, He Chuan-song. 2018(03). Inversion of crustal structure in Dabie orogenic belt and its dynamic significance [J]. Earthquake In China. [5] Li Hong, Jiang Yongbiao. Journal of East China University of Technology (Social Science Edition). 2011(03) [6] A review on the development and protection of the World Geopark in China [J]. Yu Han. Economic Geography. 2006(S2) [7] Study on core Competitiveness of Geoparks from the perspective of value chain [D]. Lei Bin. China University of Geosciences, 2016

## Management measures and effectiveness analysis of Yuntaishan Global Geopark under natural disasters

Xia LI<sup>1\*</sup>, Xiaopeng SANG<sup>2</sup>, Yutong ZHU<sup>3</sup>, Yuning DING<sup>4</sup>,

Yuntaishan UGGp Administration Committee<sup>1</sup> China, Forestry Bureau of Jiaozuo City<sup>2</sup> China, Chinese Academy of Geological Sciences<sup>3</sup> China, China University of Geosciences in Beijing<sup>4</sup> China

As one of the top world-class recognition as a Global Geopark, Yuntaishan UGGp has played a very strong leading role in promoting the development and construction of scenic areas, improving management services, especially the market awareness and brand influence. Facing the COVID-19 and floods, the people of Yuntaishan united to eliminate dangers, rush repairs, dredging, and killing, and fully spread the self-rescue work after the disaster. The situation of doing a lot of work quickly took shape quickly! Increase the promotion of new media such as websites, WeChat public accounts, videos, etc., and provide online-tour for tourists who cannot visit on-site. At the same time, several ticket-free activities have been carried out for appreciate heroes such as disaster relief police and anti-epidemic doctors saving Henan Province from flood hazards. Strictly implement the requirements of "Limits, Appointments, and Staggered Peaks", and restrict online reservations for tourists in high-risk areas. Yuntaishan Music Festival, the "3rd China Yuntaishan Hanfu Flower Festival, traditional festivals such as Women's Day, National Day Holiday, May Day Holiday, Earth Day, etc. activities were held to attract tourists to drive the income of the park and community residents. Also, the "National 'Internet + Tourism' Development Forum and 2021 Henan Smart Tourism Conference" was held in Zhengzhou. In the meeting, Yuntaishan was identified to be a pilot scenic spot for the "Henan Cultural Tourism Reservation Health Code". At the same time, the "Yuntaishan-Gaode Global Tourism Solution" won the Excellent Successful Case Award! Yuntaishan share wisdom construction experience and provide suggestions for the development of "Internet + Tourism".

**Keywords:** Yuntaishan UGGp, Natural Disaster, Management Measures, COVID-19, Wisdom service

**Corresponding author:** lixia@mail.cgs.gov.cn

**Reference:**

HE Xun. Discussion of Geopark Management Mode: With Yuntaishan Global Geopark as an Example [J], *Scientific and Technological Management of Land and Resources*, 2011, 28(5):102-108. ZHAO Mengmeng. Analysis on Visitors' Satisfaction and Promotion Strategy of Yuntaishan Global Geopark [J], *Journal of Nanyang Institute of Technology*, 2011, 3(3): 34-39. QIAO Guanghui. A Research on Eco-Tourism Destination Images, Tourist Satisfaction and Destination Loyalty —Taking Yuntaishan Global Geopark as an Example [J], *Economic Survey*, 2015, 32(6): 6-10. YANG Airong, GAO Yanxia. The Influence on the Development of Regional Economy by Development and Construction of Yuntaishan Global Geopark [J], *Journal of Jiaozuo Teachers College*, 2010, 26(4): 40-42.

## Oki Islands Geopark Museum: Exciting New Facility for Visitors and Residents

*Ryosuke IKENAGA<sup>1\*</sup>,*

*Oki Islands UGGp Promotion Committee<sup>1</sup> Japan*

The Oki Islands UNESCO Global Geopark is located off the coast of Shimane Prefecture in Japan, and is made up of 4 inhabited and over 180 uninhabited islands. In Okinoshima Town, the largest in the geopark by both population and area, a geopark core facility combining all four islands newly opened in April 2021. The facility is located right beside the ferry terminal, which is used by the majority of visitors to the islands. Inside are the offices of the town's tourism association and the geopark staff. On the second floor of the facility is the Oki Islands Geopark Museum, where geopark staff guide visitors through exhibitions. <Presentation contents> · The facility introduction: Role and purpose of the facility · Impressions: Resourcefulness and hardship in management <Overview of Oki Islands Geopark Museum> The exhibition room is divided into three zones. The first zone, "Geohistory," walks visitors through the birth of the Oki Islands and explains the formation of strangely shaped rock formations and scenery. In the second zone, "Unique Ecosystem," dioramas and taxidermy specimens help to introduce the organisms that live on the islands and in the sea around them, as well as illustrating the connections between the history of the land and the ecosystem. Finally, the third zone, "Lifestyles and Traditions," explores the unique history and culture of the Oki Islands, including exchange facilitated by obsidian 30 thousand years ago, the exile of emperors, Oki Traditional Sumo, and more. Also featured inside the exhibition room is a video following the story of the land from the birth of the Earth to modern-day Oki Islands. Projection mapping over a 3D model of the islands showcases various projections such as scenery, a geological map, a vegetation map, and more. Since its opening, the museum counts over 4,000 visitors and is also used for field trips for schools in the area. Recently, it has been incorporated into group tours as the first place to visit, and participants enjoy rest of the tour with basic knowledge of the Oki Islands. We aim to utilize this facility to promote geo-tourism.

**Keywords:** Oki Islands, Museum, Geotourism, Museum management, Science popularization

**Corresponding author:** [ikenaga@oki-geopark.jp](mailto:ikenaga@oki-geopark.jp)

**Reference:**

## Citizen Movements for conserving of the Mudeungsan UGGp

*HUH Min<sup>1,2\*</sup>, WOO Yeon<sup>1,3</sup>, JUNG Jongyun<sup>1,2</sup>, CHA Beomgeun<sup>2</sup>, AN Sunyoung<sup>2</sup>, LEE Yuri<sup>2</sup>*

*Department of Environmental & Earth Science, Chonnam National University<sup>1</sup>, Republic of Korea*

*Mudeungsan UNESCO Geotourism Center, Chonnam National University<sup>2</sup>, Republic of Korea*

*Geopark Team, Gwangju Green City Office, Gwangju Metropolitan City<sup>3</sup>, Republic of Korea*

The Mudeungsan (Mudeung Mt.) area of the Republic of Korea was certificated as Mudeungsan UGGp in April of 2018, and we have promoted the geo-educations, geotourisms and programs for cooperating with local people by connecting the geosites of global geological values with the surrounding historic, cultural and ecological heritage sites. In 1972, the Mudeungsan was designated as a provincial park of Cheollannam-do Province, Korea. During the 1980s the area was one of the most popular vacation destinations in South Korea. The two districts at the entrance of Mudeungsan, Jeungsimsa Temple district and Wonhyosa Temple district, were crowded with many recklessly established restaurants and lodgings. Such densely located group facilities emitted wastewater and caused serious natural damage. In this situation, the local government and citizens who loved to protect Mudeungsan were forced to native people to move such facilities from 2003 to 2010. In 2010, all restaurants and lodgings in the Jeungsimsa Temple district were moved to the new area in the lower part of Mudeungsan. After 2016, the Wonhyosa Temple district only remained as an unlawful commercial facility. Now this area is working to relocate to the other area in the lower part of Mudeungsan. The military base located on the Mudeungsan summit in 1966 has begun the relocation project by agreeing with the air force bases in November 1996. The citizens and municipal government intend to continue consultation with the air force to make the relocation project for returning to visitors of the Mudeungsan Global Geopark in its natural status. The big-sized Shinyang Park Tourist Hotel set up in 1981 was also returned to citizens by the national trust movement. Three visitor centers have been newly secured after its designation, and the 'Geo Archive' with all the arranged data related to geoparks was newly established. To establish the "East Asia UNESCO Global Geopark Platform Center," (Investment cost: 36.7 billion won) was secured in October 2020 and the detailed design project was started in 2021. In order to improve the recognition of the geopark and enhance its brand value, the Mudeungsan UGGp has attempted various promotions.

**Key words:** Citizen Movements, Conservation, Mudeungsan UGGp

**Corresponding author:** minhuh@jnu.ac.kr

**Reference:**

## An Integrated Geoproduct Development for Geotourism in Langkawi UNESCO Global Geopark, Malaysia: A Case Study of the Kubang Badak Biogeotrail

Norhayati AHMAD<sup>1\*</sup>, Ibrahim KOMOO<sup>1</sup>, Norzaini AZMAN<sup>1</sup>, Che Aziz ALI<sup>1</sup>, Azmil Munir MOHD BUKHARI<sup>2</sup>,

*Geopark and Geotourism Creative Solution<sup>1</sup> Malaysia, Geopark and Geotourism Creative Solution<sup>1</sup> Malaysia, Geopark and Geotourism Creative Solution<sup>1</sup> Malaysia, Geopark and Geotourism Creative Solution<sup>1</sup> Malaysia, Langkawi Development Authority<sup>2</sup> Malaysia*

This paper describes the development of a community-based geoproduct, known as the Kubang Badak BioGeotrail in Langkawi UNESCO Global Geopark (LUGGp), created from the idea of integrated heritage in geotourism. It reports on a developmental case study analysing the planning and activities related to developing a geotrail, including an important aspect of theming in conceptualising and developing sites, content, pit stop design, interpretation, and capacity building activities. In a geopark, continuous efforts should be directed towards managing and developing geoproducts based on integrated heritage resources to preserve them for future generations, provide geotourism activities, and serve as a socio-economic catalyst for the local community. The geotourism project described in this paper builds on the recognised need to develop geoproducts in collaboration and consultation with multiple stakeholders and is community-based. In particular, the case study is significant to those interested in developing an integrated geotourism product that includes knowledge, recreation, natural heritage and landscape conservation, human history and culture, industry cooperation, environmental management and geoproduct planning, development, and management. Furthermore, as geoproducts target tourists seeking to have the natural environment interpreted for them and expecting explanations of geology, biodiversity, history and culture, an integrated trail can create a holistic view of the ecosystems. Therefore, this kind of product can enhance geopark support for conserving natural heritage and the environment for future generations. After examining the outcomes and impact of the biogeotrail on various stakeholders: the local community, the tour guides, the tourists and the government agency, the paper concludes with brief illustrations of the complexities involved in geoproduct development and offers some suggestions for the way forward.

**Keywords:** geosite, biosite, cultural site, tourism site, geoheritage

**Corresponding author:** norhayatiahmad@ukm.edu.my

**Reference:**

Teh, G. H.; Lokeman, K. Significance of the geology and geochemistry at Teluk Ewa, Langkawi. *Warta Geol.* 1997, 23, 187-188.  
Komoo, I.; Abdul Halim, S.; Azman, N. Geotourism in Langkawi UNESCO global geopark, Malaysia. In *Handbook in Ge-otourism*; Dowling, R., Newsome, D., Eds.; Elgar: United Kingdom, 2018; pp. 355-366.  
Komoo, I.; Ahmad, N.; Abdul Halim, S.; Unjah, T. *Warisan Kubang Badak. Panduan Meneroka BioGeoTrail Kubang Badak*; LESTARI-UKM Press: Bangi, Selangor, 2019.

## Kütralkura UNESCO Global Geopark: challenges of municipal association for inclusive and sustainable rural territorial management in a process of extension

Patricia HERRERA<sup>1</sup>, Manuel SCHILLING<sup>2\*</sup>, Cristian SALAS<sup>3</sup>,

*Kütralkura UNESCO Global Geopark, Asociación de Municipalidades Cordilleranas de La Araucanía, Chile<sup>1</sup> Chile, Instituto de Ciencias de la Tierra-Universidad Austral de Chile-Valdivia<sup>2</sup> Chile, Kütralkura UNESCO Global Geopark, Asociación de Municipalidades Cordilleranas de La Araucanía<sup>3</sup> Chile*

Kütralkura was recognized as the first UNESCO Global Geopark in 2019, after nearly 10 years of collaborative work. Currently, its territory corresponds to four municipalities, which are Curacautin, Melipeuco, Vilcun and Lonquimay, covering an area of 8,115 km<sup>2</sup>. The entity in charge of managing the Kütralkura Geopark is the Association of Cordilleran Municipalities of La Araucanía (AMCA), which is conformed by seven contiguous communes that have similar characteristics and natural and cultural heritage: the four communes mentioned above, and Cunco, Lautaro and Curarrehue. At present, the local authorities of all these municipalities, together with local institutions and actors, are working to extend the area of the Kütralkura Geopark to the 7 municipalities of the AMCA, since it is considered as an important instrument for inclusive and sustainable rural territorial management that contributes to the well-being of inhabitants of this territory. With this expansion, the area of Kütralkura extends to 12,078 km<sup>2</sup>, which represents an increase of 48.82%. Consequently, and in accordance with the guidelines of the UNESCO International Geosciences and Geoparks Program, a new application is being submitted for evaluation. For this work, a participatory survey of the integrated natural and cultural heritage has been carried out, expanding considerably the database in the seven communes. In this enlargement process, the challenges of the Kütralkura Geopark are related to the strengthening of the management committee and the institutional framework that supports it, mainly regarding the articulation of different working groups at the local level. In Chile, there is a highly centralized model for the execution of public policies, which makes it difficult to articulate and implement the various sectoral programs with similar purposes in the territories. Additionally, the current institutional political context in Chile is marked by the establishment of a new constitution with the participation of constituents that have emerged from the territories, including representatives of indigenous peoples, and the generation for the first time of Regional Plans of Territorial Planning that are being led by the regions themselves. This represents a great opportunity for the Kütralkura Geopark and the AMCA, which is established as a decentralized territorial management model, and a unique natural laboratory for the debate and generation of public policies in education, conservation and geotourism with territorial and cultural relevance.

**Keywords:** Kütralkura, UNESCO Global Geopark, municipal association, land use planning, rural sustainable

**Corresponding author:** [phpintor@gmail.com](mailto:phpintor@gmail.com)

**Reference:**

Schilling, M.E., Herrera, P., Partarrieu, D.M., Martínez, P., Toro, K., Contreras, P., Martínez, T., Amthauer, J.A. (2017). Kütralkura Aspiring Geopark, Chile Application Dossier for UNESCO Global Geoparks. 48 p. (inédito). Unesco. (2011). Declaration International Congress of Geotourism, Geopark Arouca, Portugal. International Congress of Geotourism, Geopark. Arouca, Portugal. Schilling, M, Herrera, P. Kütralkura: hitos y desafíos del primer Geoparque Mundial de la UNESCO en Chile. Revista Revista de la Red de Geoparques Mundiales de la UNESCO de Latinoamérica y el Caribe - Geovivencias – n.1, Red GeolAC, 2020

## Educational Services of the Arouca UNESCO Global Geopark (Portugal) – Challenges in the Context of COVID-19 Pandemic

*Alexandra PAZ<sup>1</sup>, Artur SÁ<sup>2\*</sup>,*

*AGA - Arouca Geopark Association, Portugal<sup>1</sup> Portugal,*

*AGA-Arouca Geopark Association / UTAD-University of Trás-os-Montese Alto Douro, Portugal<sup>2</sup> Portugal*

The COVID-19 pandemic, which has had deep impacts worldwide, emerged in Portugal in March 2020. In order to control the disease transmission rates were decreed, during 2020 and 2021, the lockdown of several services for months, and/or the application of restrictive rules during these years. This fact strongly affected the educational services, namely the ones offered by the Arouca UNESCO Global Geopark (UGGp). The educational services of Arouca UGGp (Portugal), incorporate (i) educational programs with several fieldtrips about geology, biology, environment, history, and tourism designed for schools, in accordance with the Portuguese formal curricula, from kindergartens to high school and university; (ii) educational projects developed with the schools from Arouca UGGp territory (iii) training and/or awareness actions, involving teachers and/or guides. The detection of COVID-19 in Portugal occurred exactly in the middle of the 2019/2020 school year when most of the calendar is fully filled, which forced the abrupt cancellation of all activities. The educational programs, which involved 64616 students and teachers from 2008/2009 up to 2018/2019 suffered a break (considering the annual average) of 46% in 2019/2020 and 87% in 2020/2021 scholar years. Online learning became a reality for several months. This fact triggered the need to adapt services to answer to the needs of the educational community and their goals, but also the training needs of different publics. Therefore, were created and regularly developed a repository of online educational resources in the Arouca UGGp institutional website ([www.aroucageopark.pt](http://www.aroucageopark.pt)) with documentaries, practical activities, virtual classes, videos, among other materials. In turn, the educational programs started to offer online activities with presentations designed specifically for each class. The training actions such as «Granites of the Arouca UGGp», directed to teachers, or the module «Natural and Cultural Heritage in Arouca Geopark» of the course «Geotourism by Geoparks» in partnership with the Tourism Board of Portugal, were developed in an online context. With less restricted measures against COVID-19 a mixed format online/presential was chosen, for example for actions such as «Territory & Education - the case of Arouca UGGp», directed to teachers, or the two editions developed for the guides to the new infrastructure '516 Arouca' suspension bridge. A prompt answer and the adequacy of services allowed constant contact between the educational services of Arouca UGGp and our different audiences. We expect, therefore, a faster recovery and the normal development of activities (whenever possible), in order to contribute to the dissemination of the values of the UNESCO Global Geoparks and the Agenda 2030 for Sustainable Development.

**Keywords:** Geoparks, Education, Educational Programs, COVID-19

**Corresponding author:** [alexandra.paz@aroucageopark.pt](mailto:alexandra.paz@aroucageopark.pt)

**Reference:**

## Recent Activities Of Kula-Salihli UNESCO Global Geopark

*Tuncer DEMIR<sup>1\*</sup>,*

*Kula-Salihli UNESCO Global Geopark<sup>1</sup> Turkey*

Kula-Salihli UNESCO Global Geopark, located in Western Turkey, covers the administrative territories of Kula and Salihli Districts of Manisa Province in Turkey. The purpose of this presentation is to reveal the recent activities of the Kula-Salihli UNESCO Global Geopark and to share knowledge and experience in this way. These activities are outlined below. Kula-Salihli UNESCO Global Geopark is primarily the most important supporter of the geological heritage and the natural and cultural heritage linked with it. The geopark constantly monitor the geo-heritage and take various measures to protect it. In terms of educational activities, the Kula-Salihli UNESCO Global Geopark engages in efforts aimed at protecting and conserving geo-heritage, as well as minimizing the risk of natural disasters. In this contents, systematic educational activities have been organized in various schools in the area. For instance, as the earthquake is the most serious threat in the region, the geopark has been offering various earthquake training programs, emphasizing what to do before, during, and after an earthquake. The region where our geopark is located feels most clearly the influence of global climate change and therefore the drought. Therefore, the geopark continuously informs the local people about global climate change and the efficiently use of water resources, and organizes afforestation activities for the protection of the natural ecosystem. Another educational activity of the Geopark is its participation as a stakeholder in three Erasmus + projects organized by Turkey, Hungary and Poland. One of the most significant activities of the geoparks is networking. Kula Salihli UNESCO Global Geopark, which has the distinction of being the first and only UNESCO-labeled geopark of Turkey and the Turkish World, has been the partner of the Cappadocia, Denizli and Kastamonu Geopark Projects in Turkey. Our Geopark has also provided technical support to geopark establishment activities being currently carried out in Central Asian Turkic Republics, such as Kazakhstan, Kyrgyzstan, Uzbekistan.

**Keywords:** Sustainable Development, Education, Global Climate Change, Erasmus+, Geopark Collaborations

**Corresponding author:** kulageopark@gmail.com

**Reference:**

<https://kulasalihligeopark.com/>

## The impact of COVID-19 on visitor and information centres in UNESCO designated sites in Europe

*Cristian CIOBANU<sup>1\*</sup>, Alexandru ANDRASANU<sup>1</sup>, Bianca MIHAILA<sup>2</sup>, Cristina TOMA<sup>2</sup>, Maria Luiza CRETESCU<sup>1</sup>,*

*University of Bucharest-Hateg Country UGG<sup>1</sup> Romania, University of Bucharest-Hateg Country UGG<sup>1</sup> Romania University of Bucharest<sup>2</sup> Romania, University of Bucharest<sup>2</sup> Romania, University of Bucharest-Hateg Country UGG<sup>1</sup> Romania*

The Covid-19 pandemic represents the most important global health crisis of our times. It imposed multiple challenges to individuals, organizations and states regardless of wealth, race, sex or ethnicity. Among the main measures taken by the governments to stop the spreading of the virus was the temporary suspension of all social, cultural or recreational activities, in contrast with the position of UNESCO, which considers culture to be healing in times of crisis (UNESCO, 2020). The Covid-19 regulations and measures restructured the cultural sector and forced it to become more flexible. This capacity of adaptation was conditioned by the abilities of the institutions and organizations belonging to this sector. In order to assess this capacity, the Hațeg Country UNESCO Global Geopark - University of Bucharest, on behalf of the UNESCO Regional Bureau for Science and Culture in Europe, carried out a survey to collect preliminary data on the impact of COVID-19 on visitors / information / interpretation centres in UNESCO designated sites in Europe, building up on the Bureau's broader initiative on the role of visitor centres in UNESCO designated sites. The main objective of the survey was to shed light on the consequences of the pandemic and related restrictions on the activities and management of such centres and on the measures taken and / or planned by the centres in response to these challenges. The second objective was to inventory the good practices that the centres have demonstrated in the fight against the Covid-19 crisis and share them as means of sustainability in the post Covid-19 world. The pandemic certainly affected both the identity, the employees and the types of activities that the centres in UNESCO designated sites in Europe carried out during this period. Huge decreases were also occurred in the number of visitors as it decreased in 2020 by about 58% compared to the previous year. The centres have taken a series of measures in order to prevent the increase of the infection rate, including extraordinary sanitations measures, but also measures aimed at social distancing or limiting the number of visitors. The centres were very careful with the measures they took, and even took additional measures to those imposed by the authorities. The events that the centres have organized can be seen from a mixed perspective. On one hand, most of the centres organized the same events, but adapted to the pandemic, and on the other hand, the centres developed new events specially created for the pandemic situation. The leitmotif of this research report is the digitization and ability of centres to become digital, even though most of the activities were done outdoors. Research findings show that centres have been able to adapt their business and think of new innovative ways to attract visitors and increase their interest even if they are hundreds of kilometers away.

**Keywords:** visitor centre, UNESCO designations, COVID 19 pandemic, heritage interpretation, tourism

**Corresponding author:** cristian.ciobanu@unibuc.ro

**Reference:**

OECD. 2021. Culture shock: COVID-19 and the cultural and creative sectors. [online] Available at: [Accessed 7 April 2021]. Statista. 2021. Media usage during COVID-19 by country | Statista. [online] Available at: [Accessed 7 April 2021]. UN's International Telecommunications Union, 2019. Measuring digital development Facts and figures 2019. [online] Available at: [Accessed 7 April 2021]. UNESCO. 2021. In moments of crisis, people need culture. [online] Available at: [Accessed 7 April 2021].

## University-Based Projects for Sustainable Development in Hateg Country UGGp Romania

*Alexandru ANDRASANU<sup>1\*</sup>, Cristina TOMA<sup>1</sup>,*

*University of Bucharest / Hateg Country UNESCO Global Geopark<sup>1</sup> Romania,*

*University of Bucharest / Hateg Country UNESCO Global Geopark<sup>1</sup> Romania*

Hateg Country UNESCO UGGp has been created as grass roots project by a consortium of universities, local administrations and other institutions coordinated by the University of Bucharest. The university assumed its civic engagement by creating a new department dedicated to Hateg UGGp and assuring the financial, administrative and academic support. One of our main goal was to create a national and international puzzle like structure around the Hateg UGGp to support its development and to implement the UNESCO Geopark Program in Romania. The main puzzle's pieces are: partnerships, research, education, science promotion, communication and public awareness. Examples of partnership structures established are: the Geopark National Forum, the National Geoparks Network, the local UNESCO designations partnership. The University is supporting also Geoparks cooperation, a recent example being the Geotour Erasmus+ project implemented by European Geoparks and other associations. Educational support materials and a training platform have been developed in order to validate and recognize new competencies in geological tourism. Research activities are correlated with different university programs. Our aims are to facilitate people-to-people contact by playing a role in local soft diplomacy and to encourage our students to actively assume responsibility in society while critically reflecting their research experiences. Science for Resilience - research for local sustainable development is a CIVIS Open Lab project aiming to correlate research activities with local communities' issues and to open a dialogue between academics, students, geopark volunteers and local people. Edu-Geopark Network, a two years master degree program in geoconservation, and a new course in the frame of CIVIS consortium are few examples of educational structures. CIVIS is a Civic University formed by the alliance of ten higher education institutions across Europe. A new course: Implementing the UNESCO Geoparks Program in Romania is offered to CIVIS students every semester. Examples of science promotion are the two annual events: Magurele Summer Science Schools addressed to high schools students and teachers, and the H2020 ReCoN-nect project dedicated to the Researchers'Night. ReCoN-nect - The Green Deal: Research communication to CommuNities project is developed by a consortium of universities, research institutes, associations and three UNESCO or aspiring Romanian geoparks. Partners are involved in scientific experiments, public awareness, community talks, events. Communication and public awareness are supported also by a calendar of events and a good media coverage with more than 400 articles every year. The Geopark Program developed within the University of Bucharest around Hateg UGGp has created closer connections among academics and different territories allowing it to play a role in the education, innovation, culture and civic life of their local communities.

**Keywords:** Sustainable development, University of Bucharest, Hateg UGGp, Geoparks Program, CIVIS

**Corresponding author:** alexandru.andrasanu@unibuc.ro

**Reference:**

Andrasanu, A. Education and networking as pillars for progress in Hateg Country UGGp. In EGN Magazine no 19 (in preparation)

## The Management Of Upper Idrijca Landscape Park As A Protected Area Within The Idrijca UNESCO Global Geopark

*Mojca GORJUP KAVCIC<sup>1\*</sup>, Bojan REZUN<sup>2</sup>,*

*Idrijca Tourism Board (Idrijca UGGp)<sup>1</sup> Slovenia, Idrijca UNESCO Global Geopark<sup>2</sup> Slovenia*

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. The park is situated in the Idrijca UNESCO Global Geopark, with a number of monuments included in the UNESCO World Heritage List. It also includes important treasures, both natural – such as the lake of Divje jezero, the banks and troughs of the Idrijca river, the natural bathing site at Lajšt – and cultural – such as the klavže (water barriers) and the Idrijca lauf (forest railroad). The Municipality of Idrijca 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. 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 Idrijca delegated the role of park manager to the Idrijca Tourism Board, which also coordinates the Idrijca Geopark. In the first year, a 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 followed by 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. In addition, other activities put a lot of emphasis on raising awareness among park visitors about the characteristics of protected sites and the need to respect and preserve them. In 2021, a management plan is being designed. This is a complex process involving experts, the local populace, and various organizations and associations with an interest in organizing activities in the park. 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 Idrijca Geopark and preserve its natural, cultural, and geological heritage. The guidelines and work methods will be implemented in the management of the entire area of the Idrijca Geopark.

**Keywords:** landscape park, UGGp, nature conservation, sustainable development, management

**Corresponding author:** [mojca.gorjup-kavcic@geopark-idrija.si](mailto:mojca.gorjup-kavcic@geopark-idrija.si)

**Reference:**

## Community-based Adaptation Strategies to Climate Change in Muroto UNESCO Global Geopark, JAPAN

Akifumi NAKAMURA<sup>1\*</sup>,  
Muroto Geopark Promotion Committee<sup>1</sup> Japan

This presentation discusses community-based adaptation strategies to climate change in the area of Muroto UNESCO Global Geopark (MUGP hereafter), focusing upon the changes of coastal and marine ecosystems.

1) Utilizing invasive species for developing geo-products : Cape Muroto is located at the southern tip of Muroto Peninsula and categorized into sub-tropical climate due to the Kuroshio warm current. Rich sub-tropical vegetation, therefore, is observed in Cape Muroto. Opuntia cactus (*Opuntia microdasys*), one of invasive species with high fertility, is observed in such ecosystem. It is predicted that the area opuntia cactus is observed is expanding influenced by global warming. Removing the opuntia is urgent issue for protecting local environment. Conservation Team, composed of local citizens, work on removing the opuntia and discussing an idea to make pet food for the reptiles as a new geo-product by using it.

2) Taking actions by local fishermen: Fixed-net fishery is a traditional industry in the east coast of MUGP. Yellowtail fish is one of the famous fish for Muroto and its best season is from January to April. It has tended to recognize that the fish caught in earlier is better quality. Due to sea temperature rising, the migration area of yellowtail is gradually expanding to Hokkaido (the northern most prefecture in Japan). It interrupts yellowtail to go down to southern part of Japan around Muroto. April has been the biggest catch of yellowtail since 2015 which seems very late compared with the previous decade. Since people tend to believe that yellowtail quality is earlier, the better, the price of yellowtail is decreasing recently even with a big catch. Local fisherman launched a new project for branding yellowtail in April as "spring yellowtail." The quality of the fish is ensured with scientific analysis. MUGP collaborates with the above local community's activities to enhance climate resilience.

**Keywords:** adaptation, community-based action, alien species, fishing season, ecosystem

**Corresponding author:** akinakam@muroto-geo.jp

**Reference:**

Ministry of the Environment 2015. National Plan for Adaptation to the Impacts of Climate Change. Ministry of the Environment, JAPAN. <http://www.env.go.jp/earth/ondanka/tekiou/siryo1.pdf> Zommers, Z. and Alverson, K. eds 2018. Resilience : The Science of Adaptation to Climate Change. Elsevier, Netherlands.

## Human-induced Hazard vs. Natural Hazard: Microplastics and Volcanic Pumice Drifting in the Sea

Setsuya NAKADA<sup>1\*</sup>,

*National Research Institute for Earth Science and Disaster Resilience<sup>1</sup> Japan*

Marine pollution by microplastics is a hazard that was induced by the human being, through successively littering plastic materials during a long period. Non-woven disposable masks and disinfectant papers littered during the COVID-19 are thought to become a new entry of microplastics and microfibers in the sea. Drifting microplastics in the sea are impossible to be removed all, and continue to give a damage to the ecosystem including human being. The similar impact can be encountered by natural hazard, as below. A large amount pumice from a submarine eruption which occurred on the Fukutoku-Okanoba seamount in the Ogasawara Islands, 1,300 km South of Tokyo in middle August 2021, arrived successively in the Ryukyu Islands, SW Japan about two months later, after their >1,000 km drifting westward from the seamount in the Pacific Ocean. The drifting of pumice to the coast gave a very strong threat to us because they are "visible". It introduced serious problems in fishery, sea transportation, tourism and some people's life in those area. The coastal ecosystem may be damaged by these pumices for a short time scale, though pumice would sink and deposit on the sea floor. Furthermore, some of floating pumice can be removable from the sea. Pumice drifting has repeated over the world historically and we cannot avoid it. The time scale of drifting is essentially different of pumice from microplastics. The impact of pumice drifting would be limited around a year. On the other hand, microplastic drifting in the sea would not. The pollution by microplastics becomes worse and serious, silently and non-visibly, and it continues for much longer time. However, can do our best to reduce the adding of microplastics in the sea. Beach and riverbank cleaning is a small effort to eliminate marine pollution, but it is very effective for raising people's awareness on marine pollution and environmental destruction. Beach and riverbank cleaning is an event that should be taken the initiative in Geoparks as one of the efforts to leave a beautiful and safe planet Earth for the future generation.

**Keywords:** volcanic pumice, submarine eruption, environmental distraction, microplastics, Beach and riverbank cleaning

**Corresponding author:** [nkd.sty@gmail.com](mailto:nkd.sty@gmail.com)

**Reference:**

<https://en.unesco.org/ocean-decade>

## Naturtejo UNESCO Global Geopark (Portugal) contribution to wildfire risk reduction

*Joana RODRIGUES<sup>1\*</sup>, Carlos NETO DE CARVALHO<sup>2</sup>, Maria Manuela CATANA<sup>2</sup>, Mariana VILAS BOAS<sup>3</sup>,*

*Naturtejo UNESCO Global Geopark<sup>1</sup> Portugal, Naturtejo UNESCO Global Geopark, Municipality of Idanha-a-Nova<sup>2</sup> Portugal, Naturtejo UNESCO Global Geopark, Municipality of Idanha-a-Nova<sup>2</sup> Portugal, Naturtejo UNESCO Global Geopark, Municipality of Penamacor<sup>3</sup> Portugal*

The European Forest Fire Information System shows that between 2000 and 2019 Portugal was the EU country with the largest burned area. In 2017 severe wildfires affected Naturtejo Geopark. A total of 561 km<sup>2</sup> were destroyed mainly by megafires occurred on days with extreme weather conditions. Beside forest areas, farms and some villages, several protected areas and geosites were affected. After these great devastation episodes municipalities have made efforts and investments in the prevention and recovery of the areas. Naturtejo UGGp is located in central Portugal, a region where probability of high intensity, simultaneous and impossible-to-extinguish fires is increasing, according to the EU reports. The Geopark is committed to address the challenges of disaster risk reduction and, together with the municipalities, promotes environmental awareness and education, contributing for a more resilient territory facing global warming and fire risk. Several initiatives with volunteers were organized to clean forest and burned areas, to control invasive exotic species and to reforest affected areas, such as the relic subtropical evergreen forest in Fraga da Água d'Alta geosite or the International Appalachian Trail. To boost the recovery of all the affected villages in the municipality of Oleiros, field activities took place, with more than 1400 residents and visitors focusing on natural and cultural heritage and including reforestation actions. Also in less affected areas, such as the municipality of Penamacor, local communities old Christmas festivities lately include reforestation actions. Since 2009, Naturtejo Geopark's Educational Programs include regular environmental education activities dedicated to forest, also comprising the annual celebration of the Native Forest Week with local schools. In partnership with the Living Science Centre of the Forest, the Geopark organized the traveling exhibition 'Forest that unites Us'. Just after the megafires of 2017 Naturtejo UGGp promoted the Campaign 'Plant the Future: Adopt a native tree and come to our Geopark to plant it!' in national and international Tourism Fairs, with more than 1000 trees distributed and a great public attention. The Barrocal Park was open in 2020 in the city of Castelo Branco, a 1,5M€ and 40 ha nature park devoted to promote the regeneration of the native Pyrenean oak forest in a granite landform geosite and providing environmental education activities. The Code of Conduct and Best Practices of Portuguese Geoparks, recently created by the Portuguese UGGps and the Tourism Authority, with the support of the Agency for the Integrated Management of Rural Fires, includes specific instructions regarding forest fires. Under Geoproducts and GEOfood brand, Naturtejo UGGp has been working closely with farmers and producers raising awareness of the importance of sustainable and resilient traditional agriculture practices contributing to agroforestry management and to fire resilient landscape.

**Keywords:** Naturtejo UNESCO Global Geopark, risk reduction, megafires, resilience

**Corresponding author:** joana.rodrigues@naturtejo.com

**Reference:**

Rodrigues J. Neto de Carvalho C. Catana M. Vilas Boas M. 2021 Naturtejo UNESCO Global Geopark (Portugal) contribution to wildfire risk reduction

## The Role of Local Governments in Responding to Climate Crisis

Azmil Munif MOHD BUKHARI<sup>1\*</sup>,  
*Langkawi Development Authority<sup>1</sup> Malaysia*

Malaysia Langkawi is a popular beach and resort holiday destination has been accorded as UNESCO Global Geopark on 1st June 2007 gave as the island a new world-class brand. Langkawi has also made history as the world's first Geopark in Malaysia and Southeast Asia. This recognition not only attractively tourists who love natural beauty but also scientists, geologists, students and researchers of various fields around the world. The economic goal of Langkawi UNESCO Global Geopark is to create new markets segmentation and increase job opportunities for the locals. As a rapidly growing tourist island, development on the coast need to be based on balanced development in terms of physical, economic and social in order to ensure the sustainability of Langkawi as the major tourist island in the world. Taking into account the potential and future development trends of Langkawi, it is clear that there will be pressured on the demand for land specifically for development in the tourism sector. The key to the success of formulating a development program depends on the 'availability' of up -to -date and comprehensive data and information to assist in formulating a policy and implementation strategy. Data and information will also be used to monitor the implementation of projects and measure the level of performance as well as formulate mitigation measures in the case of coastal development. Langkawi like other islands in Malaysia is vulnerable to various types of geo-hazards. Langkawi Island needs to have an adequate network of management machinery and capabilities to deal with disasters effectively and in turn be able to recover quickly. Geo-hazards management on Langkawi requires involvement and cooperation of various government agencies, private sector, non-governmental organizations and local community. Coastal areas and seawalls are areas that are often prone to natural disaster phenomena such as floods. Essentially, disaster management consist of elements that are interrelated with each other namely prevention, preparedness, mitigation, emergency relief missions and rehabilitation. Thus, the development of an effective and efficient disaster management system is very important in ensuring sustainable and resilient development along the coastline and seawall areas while ensuring the safety of the public and property continue to be protected before, during and after a disaster. Weaknesses in terms of guidelines and development control in these coastal areas will lead to the destruction of marine ecosystems, environment, imbalance of physical and economic development in the long run.

**Keywords:** Langkawi, Geopark, Geo-hazards

**Corresponding author:** azmil@lada.gov.my

**Reference:**

# INDIGENOUS KNOWLEDGE OF TAY ETHNIC GROUP IN THE LANG SON ASPIRING UNESCO GLOBAL GEOPARK AND IMPLICATION FOR CLIMATE CHANGE ADAPTATION

Huong PHAM<sup>1\*</sup>, Vinh HOANG<sup>1</sup>, Pao HOANG<sup>2</sup>, Van TRAN<sup>3</sup>,

*Lang Son Aspiring UNESCO Global Geopark<sup>1</sup> VietNam, Lang Son Aspiring UNESCO Global Geopark<sup>1</sup> Vietnam, Lang Son Union of Science and Technology Associations<sup>2</sup> VietNam, Vietnam Institute of Geosciences and Mineral Resources<sup>3</sup> Vietnam*

This presentation investigates the indigenous knowledge of Tay Ethnic Group in the Lang Son Aspiring UNESCO Global Geopark and implication for climate change adaptation. Lang Son is a mountainous province in the northeast border of Vietnam, where there is majestic nature and colorful culture. Lang Son is regarded as a land of convergence and exchange among seven main ethnic groups: Nung, Tay, Kinh, Dao, Hoa, San Chay, Mong and so on. These groups have diverse farming and cultural practices with climate change adaptation traditions. Through Tay Ethnic Groups' farming and cultural practices, the authors analyze indigenous knowledge on farming techniques, animal husbandry and house architecture for implication for climate change adaptation. The findings may hopefully help local authorities to adopt planning and policies to well-suit methods of farming and cultural practices to the environment, increasing indigenous people's resilience to climate change while developing economy sustainably, improving livelihoods within the Lang Son Aspiring UNESCO Global Geopark.

**Keywords:** Indigenous knowledge, Climate change adaptation, Tay Ethnic Group

**Corresponding author:** phamhuongnvl@gmail.com

**Reference:**

Dien and Van (2014), Agricultural Production Model Adapt to Climate Change based on Indigenous Knowledge of Ethnic Minorities in Bac Kan Province, Vietnam.

## Strategies for tackling Climate Change in the Burren and Cliffs of Moher UGGp

*Carol GLEESON<sup>1</sup>, Eamon DOYLE<sup>2\*</sup>,*

*Burren and Cliffs of Moher UGGp<sup>1</sup> Ireland, Burren and Cliffs of Moher UUGp<sup>2</sup> Ireland*

The Burren and Cliffs of Moher UGGp is located on the Atlantic coast of Ireland at the western margin of Europe. Climate Change models predict increased storminess along the west coast of Ireland and increased intensity of rainfall events during winter months and decreased rainfall during the summer. Alongside national and local authority strategies, the Burren and Cliffs of Moher UGGp has a number of active climate change mitigation and adaptation strategies as well as new projects in development. Current projects include a Code of Practice for Sustainable Tourism Businesses which includes a new Carbon Footprint calculator as well as emission, water, energy, food waste and wastewater reduction goals. The Geopark is working with local tourism businesses to source carbon offset projects with direct benefits to local habitats and communities and has joined the GEOfood project to help reduce the carbon footprint of the food industry in the region. A second strategy is groundwater and river catchment awareness through citizen science which involves locals collecting rainfall and river level data and entering that data onto a live online database (<https://www.burrengeopark.ie/learn-engage/rainfall-river-level-data/>). In addition the Geopark has a collaborative groundwater data logging project with the Earth and Ocean Sciences Department at National University of Ireland, Galway and the Geological Survey of Ireland which will help predict the extent of local flooding events based on predicted increase in rainfall. This data will inform the Local Authority and Regional Development and Climate Action Plans. The predicted increase in storm events and sea-level are likely to have significant erosional impacts on our coastal dunes. The Geopark has been running an ongoing dune protection and monitoring project at Fanore Beach Geosite for over a decade which has stabilized the dunes and given them extra protection to survive longer in future conditions.

**Keywords:** Climate action, Flooding and storms, Carbon calculator, Citizen science, Dune protection

**Corresponding author:** [cgleeson@clarecoco.ie](mailto:cgleeson@clarecoco.ie)

**Reference:**

<https://www.burrengeopark.ie/learn-engage/climate-change/>, <https://www.burrengeopark.ie/learn-engage/rainfall-river-level-data/>,  
<https://www.burrengeopark.ie/sustainable-tourism/sustainable-tourism-in-the-geopark/>

## Plio-Pleistocene Climate and Sea Level Change in the English Riviera UNESCO Global Geopark

*Malcolm HART<sup>1\*</sup>, Jenny BENNETT<sup>2</sup>, Drake CIRCUS<sup>3</sup>, Crockernwell COURT<sup>4</sup>*

*English Riviera UGGp<sup>1</sup> United Kingdom, School of Geography Earth & Environmental Sciences, University of Plymouth<sup>2</sup> United Kingdom,  
Plymouth PL4 8AA<sup>3</sup> United Kingdom, Crockernwell, Exeter EX6 6NA<sup>4</sup>, United Kingdom*

The English Riviera UNESCO Global Geopark covers the three towns of Torquay, Paignton and Brixham (South-West England). The geology of the Geopark consists of marine Devonian strata, with the Middle Devonian characterized by coral-rich, fossiliferous limestones. The Devonian strata are overlain by continental red beds of Permian age. The Devonian succession was folded and faulted during the Variscan Orogeny and now displays some quite complex geological structures. Around the Geopark there are numerous important outcrops that are protected by national designations including Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR) and local geological sites (RIGS). Part of the marine area of the Geopark (Tor Bay) is a designated Marine Conservation Zone with regionally important sea grass meadows (an important 'sink' for CO<sub>2</sub>). Within the territory of the Geopark are a range of 'fossil' climate signals such as raised beaches, submerged forests, marine peneplanation surfaces (of Pliocene and Miocene age), terrestrial cave deposits with exceptional faunas as well as hominin remains, and marine caves with sediments that can be related to interglacial periods. All these geological features can be used to document the climatic and sea level changes during the Plio-Pleistocene and despite present-day CO<sub>2</sub> levels being higher than in the Pleistocene, sea level is not as high as in Marine Isotope Stage 5 (125,000 years B.P.). This 'lag' is concerning as it probably means that rates of sea level change could increase without warning in order to establish a more realistic response to the changing climate. Indeed, the late Pliocene CO<sub>2</sub> levels have almost been reached (415–420 ppm) and that should mean a further 10–15 m rise in sea level to attain the levels previously seen in the Pliocene. The geological features of the English Riviera UNESCO Global Geopark are important to our understanding of these significant environmental changes following on from COP26 and provide a valuable location in which to raise the public understanding of the science of climate change.

**Keywords:** English Riviera Geopark, Climate Change, Sea Level Change, Pleistocene Stratigraphy, Cave Deposits

**Corresponding author:** M.Hart@plymouth.ac.uk

**Reference:**

## UNESCO Global Geoparks in the UK: Fighting Against Climate Change

*Kirstin LEMON<sup>1</sup>\*,*

*British Geological Survey<sup>1</sup> United Kingdom*

There are currently eight UNESCO Global Geoparks in the UK, all of whom are at risk from the impacts of climate change. These risks include damage to the natural environment, damage to infrastructure, risks to health and well-being, risks to business and industry, and global impacts that will affect the UK. Whilst the impact of climate change on the UK will be great, there are a range of climate change mitigation and adaptation measures that are being taken across the UK UNESCO Global Geoparks. This paper aims to highlight the variety of actions that are being taken and how they are contributing to the fight against climate change. All of the UK UNESCO Global Geoparks and aspiring UNESCO Global Geoparks took part in a climate change workshop organised by the UK Committee for UNESCO Global Geoparks in conjunction with the UK National Commission for UNESCO. The main purpose of this workshop was to provide information on climate change impacts in the UK and to assess what mitigation and adaptation measures have been or are being undertaken by the UK UNESCO Global Geoparks or their partners. For climate change mitigation, amongst the eight UK UNESCO Global Geoparks there are examples of enhancing natural carbon sinks, more sustainable use of lands and forests, responsible consumption of natural resources, adopting renewable energy sources and developing more sustainable transport systems. For climate change adaptation there are examples of nature-based solutions, engineered solutions, encouraging behavioural change, establishing good environmental governance and gathering of research and data. Whilst there is plenty of evidence of positive steps being taken to mitigate for and adapt to climate change by the UK UNESCO Global Geoparks, it is clear that there is much more that can be done. With the UK hosting the most recent COP26 meeting in Glasgow in November 2021, it is time to enhance the efforts being made so that the UK UNESCO Global Geoparks can strive to become world leaders in climate action. In order to achieve this, when identifying measures to address the impacts of climate change it is essential that this is done in alignment with the 17 UN Sustainable Development Goals. By looking at these holistically, the UK UNESCO Global Geoparks will have a real opportunity to not just help to mitigate and adapt to the impacts of climate change, but to make a real difference to those that live, work and visit their territories.

**Keywords:** climate change, mitigation, adaptation, UK Committee for UNESCO Global Geoparks, UN Sustainable Development Goals

**Corresponding author:** klem@bgs.ac.uk

**Reference:**

Betts, R.A. and Brown, K. (2021). Introduction. In: The Third UK Climate Change Risk Assessment Technical Report [Betts, R.A., Haward, A.B. and Pearson, K.V.(eds.)]. Prepared for the Climate Change Committee, London. Available from:

<https://www.ukclimaterisk.org/wp-content/uploads/2021/06/Technical-Report-The-Third-Climate-Change-Risk-Assessment.pdf> UK

Climate Change Committee (2021). Independent assessment of UK climate risk: advice to government for the UK's third Climate Change Risk Assessment (CCRA3). Climate Change Committee, UK. Available from:

[https://www.theccc.org.uk/wp-content/uploads/2021/07/Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CC\\_C.pdf](https://www.theccc.org.uk/wp-content/uploads/2021/07/Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CC_C.pdf)

## Using Active Faults as Educational Tools on Natural Hazard and Disaster Mitigation. Western Lesvos Island as a Case Study

*Aggelos LAMPRAKOPOULOS<sup>1</sup>\**, *Nickolas ZOUROS<sup>1</sup>*,  
*University of the Aegean<sup>1</sup> Greece, University of the Aegean<sup>1</sup> Greece*

Lesvos Island is located at the Northeast Aegean Sea and is the third biggest island in Greece. Lesvos Island is determined by the geotectonic regime of the broader area of the Eastern part of the Mediterranean where a subduction zone is taking place between the African and the Eurasian tectonic plates, in the Aegean region. The area is also affected by the dextral strike slip of the North Anatolian fault, which ends in the Aegean basin and creates significant tectonic structures such as the North Aegean trough and the Skyros trough etc. Intense volcanic activity appeared on Lesvos Island during Lower Miocene (23.5 to 16 million years ago) and the volcanic rocks are covering the 2/3 of the island's surface. The Western peninsula of Lesvos is covered mainly by pyroclastic rocks. The morphology is smooth as the pyroclastic formations can be easily eroded and thus do not preserve morphotectonic structures for a long time. The opportunity to identify active faults in western Lesvos, to map and study them, was given by the construction of the new Kalloni – Sigri road. The extensive road cuts permit the observation and study of the tectonic structures. The fault planes, previously hidden and covered by the vegetation were recognized, mapped, and measured. The fault planes affecting the pyroclastic formations along the extensive road cuts of the new Kalloni – Sigri road, consist significant indicators for the tectonic deformation in the area, and thus are characterized as tectonic geosites. Extensive field work was carried out for the study of the structures and the results, useful to identify the tectonic deformation in the broader area, will be presented through interpretation panels in situ. These sites can be used as educational tools for geo-hazard educational activities in order to raise awareness on earthquake hazard to the broad public. The Natural History Museum of the Lesvos Petrified Forest included some of this significant faults within the "open –air Museum" which is under construction along the Kalloni-Sigri road, as excellent elements to present the geological processes affecting the area, to the broader public.

**Keywords:** Lesvos Island UNESCO Global Geopark, Tectonics, Fault Mapping, Education, Awareness

**Corresponding author:** lamprakopoulosa@gmail.com

**Reference:**

Chatzipetros, A., Kiratzi, A., Sboras, S., Zouros, N. and Pavlides, S., 2013. Active faulting in the north-eastern Aegean Sea Islands. *Tectonophysics*, 597-598, pp.106-122  
Kiratzi, A., 2018. The 12 June 2017 Mw 6.3 Lesvos Island (Aegean Sea) earthquake: Slip model and directivity estimated with finite-fault inversion. *Tectonophysics*, 724-725, pp.1-10.  
Nomikou, P., Papanikolaou, D., Lampridou, D., Blum, M. and Hübscher, C., 2021. The active tectonic structures along the southern margin of Lesvos Island, related to the seismic activity of July 2017, Aegean Sea, Greece. *Geo-Marine Letters*, 41(4).  
Zouros, N., Pavlides, S., Soulakellis, N., Chatzipetros, A., Vasileiadou, K., Valiakos, I. and Mpentana, K., 2011. Using Active Fault Studies for Raising Public Awareness and Sensitisation on Seismic Hazard: A Case Study from Lesvos Petrified Forest Geopark, NE Aegean Sea, Greece. *Geoheritage*, 3(4), pp.317-327.

## Rumble And Tremble, An Educational Exhibition To Promote Earthquake Awareness In The Apuan Alps UGGp (Italy)

*Alessia AMORFINI<sup>1\*</sup>, Antonio BARTELLETTI<sup>1</sup>, Spina CIANETTI<sup>2</sup>, Carlo MELETTI<sup>2</sup>, Giuseppe OTTRIA<sup>3</sup>,  
Apuan Alps UGGp<sup>1</sup> Italy, Apuan Alps UGGp<sup>1</sup> Italy, Istituto Nazionale di Geofisica e Vulcanologia<sup>2</sup> Italy,  
Istituto Nazionale di Geofisica e Vulcanologia<sup>2</sup> Italy, Istituto di Geoscienze e Georisorse-CNR<sup>3</sup> Italy*

The Apuan Alps, part of the Apennine orogenic system in Italy, are a tectonically active region. Hence, the Geopark area, being bordered by the Garfagnana-Lunigiana sector which is one of the most hazardous seismic zones in the Northern Apennines, is prone to earthquakes occurrence. Moderate to strong earthquakes have historically been recorded, the last damaging event being the Mw 5.1 in June 2013. However, the strongest earthquake occurred on 7th September 1920: it caused more than 200 deaths, the destruction of entire villages and severe damage to buildings and roads all over an area of more than 1,000 square kilometres around the epicentre located west of Piazza al Serchio village (Garfagnana). Based on the historical reports of the damage, the earthquake had an intensity of IX/X degrees MCS (Mercalli-Cancani-Sieberg Scale), consistent to the Richter magnitude of 6.5 as computed on historical seismograms. The Apuan Alps UGGp has always promoted projects and activities aimed to raise the awareness of local communities to improve the resilience and to mitigate risks deriving from natural hazard events. Since the experience and knowledge of what happened in the past is important for planning a safer future, in the centenary anniversary of the 1920 earthquake, the Geopark launched the Project "1920-2020: preserving the memory of a past disaster". Despite the pandemic, an educational webinar and the presentation of a book were organised on the International Day for Disaster Risk Reduction 2020 and 2021, with regard to the 1920 earthquake in Garfagnana-Lunigiana. Work on the main initiative, i.e. the educational exhibition entitled "Rumble and Tremble" on the 1920 earthquake, instead, is now in progress. The exhibition is to be inaugurated in 2022 in the Geopark Visitor Center of Equi Terme, which also houses the ApuanGeoLab, the interactive path of local and global Earth Sciences. The exhibition includes the historical images of the disaster which are photos mostly of destroyed buildings, survivors and rescue work. This moving section aims to keep the memory of the enormous disaster alive so that it may become the collective memory of the Geopark community. The core of the "Rumble and Tremble" exhibition is made up of panels dealing with the 1920 seismic event and subsequent phase of rescue and aid within the general framework of the earthquake phenomenon, thus connecting local issues to global geological issues. This scientific section aims to answer questions such as what an earthquake is and why it occurs, where an earthquake is located and how it is measured, how strong it can be, what the relationships between seismic hazard and seismic risk are and how to implement good practices for seismic prevention and risk mitigation. A third sector of the exhibition, to be called the Geoparks Network corner, will focus on the experiences of other UNESCO Global Geoparks in terms of scientific dissemination and education on earthquakes risk mitigation.

**Keywords:** Apuan Alps, earthquake, seismic hazard, risk awareness

**Corresponding author:** aamorfini@parcapuane.it

**Reference:**

## Researching and educational activity on climate change in Yangan-Tau UNESCO Global Geopark

*Ekaterina BOGDAN<sup>1</sup>, Larissa BELAN<sup>1\*</sup>,*

*Yangan-Tau UGGp and Bashkir State University<sup>1</sup> Russian Federation, Yangan-Tau UG Gpand Bashkir State University<sup>1</sup> Russian Federation*

The climate change problem is similar for Yangan-Tau UGGp as all the world. Here is increasing of temperature and decreasing of precipitation [1]. That is why here is a problem with sickness of birch trees and extreme flood. Yangan-Tau UGGp geopark have different educational and research activities on climate change. Last year our initiatives were supporting by Russian Geographical Society. It is well-known and significant organization, which support many projects in culture, history, environment and education from all Russia. In Yangan-Tau UGGP children involves in research process: in field work and zoom lessons. Results of research shows, that sickness of birch trees is mostly on areas where temperature of soil is higher and humidity is lower. Maps of surface temperature, which were preparing by analyzing of remote sensing, are demonstrating sites with the highest climate change threat. The Yangan-Tau Geopark has entered the program of carbon polygons of the Russian Federation. Methods of ground and remote assessment of carbon deposition by overgrown with forest on past agricultural fields will be worked out on its territory. In future Yangan-Tau UGGp plans creating carbon farms. Carbon farms is an area where carbon is deposited in the form of plant biomass, peat, soil humus. Results of analyzing changing vegetation from 1985 to 2018 demonstrate the increasing of not used agricultural lands, which can be carbon farms.

**Keywords:** climate change, remote sensing, carbon polygon, carbon farm

**Corresponding author:** eavolkova@bk.ru

**Reference:**

1. Bogdan E., Belan L., Akbashev A. Demonstration of climate change in the Yangan-Tau Geopark (Russia) / Abstracts book. The 6th Asia Pacific Geoparks Network (APGN) Symposium. Lombok – Indonesia. 31 August – 6 September. 2019. P. 62

## The Green Geopark's Museum: A Climate Change Adaptation Case Study

Ilias VALIAKOS<sup>1\*</sup>, Nickolas ZOUROS<sup>1</sup>, Konstantina BENTANA<sup>1</sup>,

Natural History Museum of the Lesvos Petrified Forest<sup>1</sup> Greece, Natural History Museum of the Lesvos Petrified Forest<sup>1</sup> Greece,

Natural History Museum of the Lesvos Petrified Forest<sup>1</sup> Guadeloupe

The Natural History Museum of the Lesvos Petrified Forest was officially opened in 2001. A key element of its architectural design was the respect for the natural environment and the integration of the building in the natural landscape. It is a single-story building with a total area of 1597 sq.m. Characteristic of its exterior is the gray lava stone structure, the rock created by the successive volcanic eruptions that resulted in the creation of the Lesvos Petrified Forest. The museum hosts and exhibits impressive fossils of the natural history from the Aegean Region, Greece and from various areas around the world. The last year the Museum has been transformed into a "green museum", with almost zero energy consumption. This important action aimed to upgrade the energy label of the Natural History Museum of the Lesvos Petrified Forest from D to A+. The aim of the project was to significantly reduce the primary energy consumption of the building with significant energy savings and reduction of greenhouse gas emissions. The interventions included

- the energy consumption reduction of the external shell of the building, with the installation of new technology frames, the installation of shades to protect the building from the sun, the strengthening and the joining of the skylights of the atriums as well as the two exhibition halls and the improvement of the isolation of the roof of the building.
- the energy upgrade of the cooling-heating equipment.
- the installation of an autonomous photovoltaic system.
- the upgrade of the lighting of the museum with the replacement of luminaires lamps with new LED technology lamps. From the above-mentioned improvements, it is estimated that the annual energy savings will be 210 kWh/m<sup>2</sup> or 79,9% in comparison to the previous consumption. Consequently, the reduction of CO<sub>2</sub> emissions is estimated to 74.90 Kg/m<sup>2</sup>. The payback period has been calculated to be 8,05 years. With the completion of the project, a special educational program has been launched to inform visitors about the challenges associated with climate change and actions to slow it down. In particular, best practices and methodologies are presented for the upgrading of buildings, the reduction of greenhouse gases, and the utilization of renewable energy sources. The project has been financed by ERDF funds of the Operational Program "North Aegean 2014-2020" of the Region of North Aegean.

**Keywords:** Museum, Climate Change, CO<sub>2</sub> emissions

**Corresponding author:** ivaliakos@yahoo.gr

**Reference:** Zouros, N., Iosifides, Th., Valiakos, I., Moliou, M., Mpentana, K., Labaki O. (2006). Lesvos Petrified Forest Geopark: An analysis of visitors' preferences and characteristics. 2nd UNESCO International Conference on Geoparks. Belfast 17-21 September 2006. Abstract volume p. 99. Zouros, N., Mpentana, K., Valiakos, I., Vasileiadou, K. and Kyriazi, E. (2008). Educational activities in Geoparks and new technological tools for earth heritage interpretation – The Lesvos Petrified Forest – Greece as a case study International geological Conference Oslo Abstract Volume. Zouros, N., Valiakos, I. (2009). The Lesvos Petrified Forest Geopark Geoconservation, geotourism and local development. The 3rd International Symposium on the Development within Geoparks. Geo-heritage Protection and Cooperation. Aug. 22-25, 2009. Tai'an City, Shandong Province, China, pp. 97-99. Zouros, N., Valiakos, I. (2010b). Geoparks management and assessment. Bulletin of the Geological Society of Greece, 2010, Proceedings of the 12th International Congress, Patras, May, 2010, Vol. XLIII – No 2, pp. 965-975.

## Remains of the Kumamoto Earthquake in Aso Caldera and Utilization for Educational Program, Aso UGGP

*Takayuki KUBO<sup>1\*</sup>, Koki NAGATA<sup>2</sup>,*

*Geopark Team, Minamiaso Tourism Organization<sup>1</sup> Japan, Aso Geopark Promotion Council Office<sup>2</sup> Japan*

Aso is certified as a UNESCO Global Geopark. Eruptive activity and caldera are characteristic, but there is another characteristic feature that should be noted. Aso is also the place where earthquakes occur. In 2016, there was a huge earthquake consisting of two tremors of Mm 6.2 and 7.0. The Futagawa fault was confirmed in the Aso caldera, and many landslides occurred on the slope around the caldera. As a result, houses, tourist facilities, and transportation infrastructure such as roads and railroads were severely damaged. Now, five years have passed since the earthquake, and maintenance of earthquake remains such as faults and landslides has been completed. It is extremely difficult to live in the land of Geopark because there are not only benefits but also disaster risks. Conversely, our ancestors were able to continue living in Aso despite multiple disasters by seeking the correct knowledge to reduce disaster risk. That is why we are still learning how Aso was formed and what kind of geo-activities can occur in the future. It is very significant for the development of Aso's unique culture and civilization. Therefore, in Minamiaso, we developed an educational program that provides an opportunity to think about coexistence with nature from the earthquake experience. The guide explains while showing the earthquake remains around the Tateno Gorge Geosite. Currently, we provide the program for about 5,000 students annually. In the Tateno Gorge Geosite where the earthquake fault was confirmed this time, the myth that the god of Aso kicked off Somma (caldera wall) had been transmitted. Now that scientific knowledge has been accumulated, how can we convey both Geo's benefits and disaster risk through generations as an alternative to the myth? We demonstrate one of the answers with our education program.

**Keywords:** disaster risk reduction, educational program, resilience, hand down for generations, myth

**Corresponding author:** kubo@minamiaso.info, info@aso-geopark.jp

**Reference:**

## Spatial characteristics and controls on landscape evolution in Zhangjiajie UGGp of China

*He-qing HUANG<sup>1\*</sup>, Xiao ZHAO<sup>1</sup>, Guoan YU<sup>1</sup>, Yiheng ZHOU<sup>2</sup>,  
Chinese Academy of Sciences<sup>1</sup> China, Chinese Academy of Sciences<sup>1</sup> China,  
Chinese Academy of Sciences<sup>1</sup> China, Zhangjiajie UGGp<sup>2</sup> China*

Zhangjiajie UNESCO Global Geopark has a territory of 398 km<sup>2</sup> in the western Hunan province of China and is characterized predominantly by the landforms of Devonian sandstone containing quartz of more than 90%. The sandstone landforms prevail in the forms of more than 3000 sheer vertical stone pillars, peaks and walls of up to 350 m high being mixed with tableland, gorges, stone bridges and gates, and numerous streams. These geomorphic features are so spectacular as to make it a UNESCO natural heritage site in 1992, and a member of the first group of Global Geopark Network in 2004. Only a limited number of scientific studies, however, have addressed the spatial characteristics and controls of the evolution of these landforms. Using remote sensing images of a high resolution, this study constructs a Digital Elevation Model covering the entire area of the geopark. A detailed GIS analysis of the spatial distribution of typical landforms and main streams demonstrates clearly that all of the landforms are well located in a systemic form of incision dominated river system within a clearly defined drainage boundary. Furthermore, it is found that the intensive distribution of vertical cracks or joints within the thick sandstone of up to 500 m resulted from tectonic activities, strong flow eroding force, extremely hard sandstone rocks, and nearly horizontal rock layers all play a very important role in the evolution of the spectacular landscape in Zhangjiajie UGGp of China.

**Keywords:** Zhangjiajie UGGp, Devonian Sandstone, Landscape Evolution, Fluvial system, Rock Joints

**Corresponding author:** huanghq@igsnr.ac.cn

**Reference:**

## Global Geosite (CB010) - Costa Quebrada And Liencres Dune Field: A Geomorphic Evolution Model For A Retreating Coast (Cantabria, Northern Spain)

Viola Maria BRUSCHI<sup>1\*</sup>, Gustavo GUTIERREZ<sup>2</sup>, Antonio CENDRERO<sup>1</sup>,  
Universidad de Cantabria<sup>1</sup> Spain, Costa Quebrada Association<sup>2</sup> Spain, Universidad de Cantabria<sup>1</sup> Spain

The cliffs and dune field of Costa Quebrada are included in the Global Geosites of Spain (Geologic Framework Nº. 2, "Coasts of the Iberian Peninsula"; Act 33/2015, September, 21 about Natural Heritage and Biodiversity). The main interest of the site is geomorphological. A spectacular synthesis of coastal landforms is present in a very short coastal stretch. The Geosite is mainly constituted by Cretaceous rocks, in particular a complete Aptian-Campanian succession. The main geological structure is the northern flank of the San Román-Santillana syncline, in which strata dip between 45° and 85°, with maximum values at its central sector. Bedrock nature, dip and strike and relative orientation of strata with respect to wave action determine differential coastal erosion. A short walk in space provides an image of the Pleistocene-Holocene coastal evolution. Between Covachos beach and the river Pas estuary –scarcely 10 km- different evolutionary stages typical of a retreating cliff coast, determined by sea level rise and differential response of bedrock types and structures to erosion, can be observed. A series of inlets, coves and promontories appear as a result of wave action on the sub-vertical strata of alternating compact and erodible rocks. The calcarenites and sandy limestones, resistant to erosion, form most of the present coastline while inlets are carved into the very erodible marls and limestones. Cliff retreat caused by active coastal landslides is clearly illustrated. Also, a series of raised abrasion platforms can be seen and compared with the present abrasion surface. The Liencres sand spit and dune field (one of the most extensive in N Spain), and adjacent Pas estuary, are a very good example of sedimentation processes determined by the interplay between fluvial, tide and wave dynamics. The excellent accessibility and observation conditions in the Global Geosite, and a wide variety of morphologies, make it ideal for understanding the processes and factors which determined coastal evolution in the past, as well as presently active processes and their likely consequences in the near future. The rate at which some geomorphic processes take place (sediment deposition, cliff retreat, etc.) make this area ideal for monitoring some geoindicators of rapid environmental change, of particular interest in the present context of climate change and sea level rise.

**Keywords:** Costa Quebrada Geologic Park, geomorphic evolution model, coastal cliff retreat, Global Geosite Project, Cantabria Region

**Corresponding author:** bruschi@unican.es

### Reference:

ARTEAGA, C. & GONZÁLEZ MARTÍN, J. (2005). Natural and Human Erosive Factors in Liencres Beach Spit and Dunes (Cantabria, Spain). *Journal of Coastal Research*, nº 49, pp. 70-75. ARTEAGA, C. & SANJOSÉ, J. & SERRANO, E. (2008). Terrestrial photogrammetric techniques applied to the control of a parabolic dune in the Liencres dune system, Cantabria (Spain). *Earth Surface Processes and Landforms*, nº 33, pp. 2201 - 2210. BONACHEA J., BRUSCHI VM., FERNÁNDEZ G., REMONDO J., GONZÁLEZ-DÍEZ A., DÍA DE TERÁN JR. y CENDRERO A. (2014). Geomorphic hazards in Spain. F. Gutiérrez and M. Gutiérrez (eds.), *Landscapes and Landforms of Spain*. World Geomorphological Landscapes. Springer Science+Business Media Dordrecht: 319-345. BRUSCHI VM. (2008). Desarrollo de una metodología para la caracterización, evaluación y gestión de los recursos de la geodiversidad. Tesis Doctoral en Red, Universidad de Cantabria, (España), pp. 654. BRUSCHI V. and REMONDO J. (2019). The Cantabrian rocky coast. JA. Morales (Ed.). *Spanish coastal systems: Dynamic processes, sediments and management*. Springer: 79-92. ISBN 978-3-319-93168-5. DIAZ DE TERAN MIRA JR., BRUSCHI VM., CENDRERO A., FRANCÉS E., FLOR PEREZ E., GONZÁLEZ LASTRA JR. (2016). El Litoral entre Santander y Liencres. *Costa Quebrada Parque Geológico*. LIBRERIA ESTUDIO(Ed.) Santander, p. 300. DUQUE LC.(1983). Puntos de Interés Geológico en el sector oriental de la Cordillera Cantábrica – IGME, pp. 76. FLOR G., MARTÍNEZ CEDRÚN P. y FLOR BLANCO G. (2011). Campos dunares de Asturias, Cantabria y País Vasco. En: Eulalia Sanjaume y Francisco Javier Gracia (Eds.). *Las dunas en España*. Sociedad Española de Geomorfología, pp. 159. MARTÍNEZ CEDRÚN P. (2009). Caracterización morfológica y sedimentológica de los campos dunares costeros de Cantabria. Evolución ambiental. TDR, Universidad de Oviedo. MARTÍNEZ CEDRÚN P. y FLOR G. (2008). Rasgos geomorfológicos y sedimentarios del campo dunar de Liencres (Cantabria). *Trabajos de Geomorfología en España, 2006 – 2008*. X Reunión Nacional de Geomorfología, Cádiz 2008, pp. 275. RIVAS, V. & CENDRERO, A. (1991). Use of natural and artificial accretion on the north coast of Spain: historical trends and assessment of some environmental and economic consequences. *Journal of Coastal Research*, 7, pp. 491-507. BRUSCHI V.M., BARBA F.J., REMONDO J., CENDRERO UCEDA A., FERNÁNDEZ G., FRANCÉS E., GONZÁLEZ-DÍEZ A., SAIZ DE OMEÑACA J., RODRÍGUEZ MANGAS V., C. GARCÍA GÁNDARA, A. FERNÁNDEZ (2012). *Geología 2012. El Madero y las dunas de Liencres, un paseo por el Cretácico de Cantabria*. Guía de Excursión. Sociedad Geológica de España, pp. 29.

## The virtues of promoting research for strengthening the values of a Geopark: the case of glacial geomorphology at the Estrela UGGp, Portugal

Gonçalo VIEIRA<sup>1\*</sup>, Emanuel DE CASTRO<sup>2</sup>,

CEG/IGOT - Universidade de Lisboa and Associação Geopark Estrela<sup>1</sup> Portugal, Associação Geopark Estrela<sup>2</sup> Portugal

The Estrela UNESCO Global Geopark is a mountain area with a rich geological heritage. The landscape is dominated by the granitic plateaus that bound by steep fault scarps rise above Tertiary planation surfaces. This peculiar morphology favored the development of a climate-sensitive plateau icefield during the Pleistocene glaciations. The high relief and deeply weathered bedrock along major faults allowed for the formation of deep valleys that drain the plateau, which showed glaciers that drained the ice-field. The Estrela glacial heritage is marked by typical erosional features in the plateau, deep glacial cirques and U-shaped glacial valleys, as well as by a large number of moraines and fluvioglacial deposits. The Estrela glaciation is known since the late XIX Century after the work of Vasconcelos Pereira Cabral (1881). It has subsequently been investigated by different generations of geographers: Hermann Lautensach (1929), Suzanne Daveau (1971) and Gonçalo Vieira (2004), which have built the current understanding of Estrela's glacial geomorphology. However, from this period until around 2018, research on glacial geomorphology of the Estrela decreased, mainly limited by lack of funding. The implementation of the Aspiring Geopark Estrela in 2017 and its approval as a UNESCO Global Geopark in 2020, led to the consolidation of research in the territory framed within the Association Geopark Estrela (AGE) strategy. Currently, glacial research in the Estrela is experiencing a new surge of interest, with new collaborations by national and international teams, that focus on improving the understanding of the glacial chronology and postglacial environmental evolution. The results start to be visible in increasing publications and on the involvement of a new generation of geoscience students. Field-based research campaigns promoted by AGE, with the synergistic use of new surveying techniques, is also impacting other disciplines active in the Geopark, such as climatology, ecology and archaeology. The UNESCO recognition and the AGE science strategy are thus strongly contributing to improve the knowledge of the scientific values of the territory, but also feeding into stronger relations with stakeholders, such as the municipalities, the Natural Park and local companies. The dissemination of the new results on the media and through communication events, such as webinars and talks, fosters the connection with local communities, that engage with the Geopark, promoting its understanding and conservation.

**Keywords:** Glacial geomorphology, Conservation, Geopark, Cooperation, Estrela

**Corresponding author:** [vieira@edu.ulisboa.pt](mailto:vieira@edu.ulisboa.pt)

**Reference:**

## Joint actions in Internationally Designated Areas within the territory of the Oeste aspiring Geopark, Portugal

Alline DIAS<sup>1\*</sup>, Miguel REISSILVA<sup>2</sup>,

Universidade da Extremadura / Aspiring Geoparque Oeste<sup>1</sup> Brazil, Aspiring Geoparque Oeste<sup>2</sup> Portugal

The territory of the Oeste aspiring Geopark (OaG), in Portugal, is within the Mediterranean and Marine Atlantic biogeographical regions. It encompasses distinct terrestrial and aquatic ecosystems, extending from the Coastal Zone of the Western Region, through plateaus, to mountain formations in the interior of the continent. This variety of landscapes are repositories of natural vegetation of national and international importance. In this biodiverse range of habitats, two Internationally Designated Area (IDA) are already established: the Ramsar Site Paul da Tornada and the Berlengas-Peniche Biosphere Reserve. Designed in 2001, the Paul da Tornada Ramsar Site is a small freshwater, permanently flooded, marsh in a small alluvial plain. This site has an international management through the Strategic Plan 2016 – 2024 and Caldas da Rainha Council. This work aimed to characterize the management actions in these designated areas, by connecting the geological heritage with other aspects of natural and cultural heritage. In addition, it subsidizes data for the integrated management of areas with multiple international designations considering the territory of the OaG. For this, the management documents of these IDAs were analyzed. Within the Strategic Plan of the Paul da Tornada Ramsar Site, the possible main action points of the OaG stand out: Strategic Goal 2 - Effectively Conserving and Managing the Ramsar Site Network (target 7) Operational Goal 4 - Enhancing Implementation (targets 14, 15, 16, 17, 18 and 19). Thus, a Cooperation Protocol was signed between the managers of this Local Nature Reserve and OaG, for the establishment of joint actions. Differently, the Berlengas-Peniche Biosphere Reserve was created in 2011. It encompasses the area of the current Berlengas Nature Reserve, the Peniche Peninsula, and a maritime corridor between the two. This area is managed by the documents Peniche County Planning Plan and Berlengas Nature Reserve Management Plan, by the Portuguese state agency for the nature conservation (ICNF). In the continental portion of this Reserve, the transition zone on the Peninsula of Peniche has several geologically relevant sites, as well as the cultural heritage of this community. The proposed actions of the OaG are in consonance with the main roles of the transition zone: i. value the traditional fishing, leisure and tourist recreation activities and conciliate them with the conservation of the biological, geological and landscape heritage; ii. promote programs and activities suitable for environmental awareness and nature tourism. According to these points, it can be concluded that the action strategies foreseen in the OaG implementation project are harmoniously integrated with the IDAs conservation efforts.

**Keywords:** designated areas, management, territorial planning, geological heritage, conservation

**Corresponding author:** adiasna@alumnos.unex.es

**Reference:**

## IMBABURA UNESCO GEOPARK: A MINE OF KNOWLEDGE TO YOUNG RESEARCHERS

*Patricia RENGEL<sup>1\*</sup>, Alexandra ONA<sup>2</sup>, Daniela QUIROZ<sup>3</sup>, Mary PULGAR<sup>2</sup>,*

*Imbabura UNESCO Geopark<sup>1</sup> Ecuador, University Yachay Tech<sup>2</sup> Ecuador, Lille University<sup>3</sup> Ecuador, University Yachay Tech<sup>2</sup> Ecuador*

When Imbabura Geopark became one official member of UNESCO Global Geoparks in 2019, several stakeholders focus efforts to advance the knowledge of the geological heritage, biodiversity, and bridge it with the community in Imbabura Province, Ecuador. Yachay Tech University signed an agreement to support students and professors in the development of research and multidisciplinary projects in the geopark. Not surprisingly, students and professors discovered a new research world in the geological and biodiversity richness of Imbabura Geopark. In the field of geology, nineteen thesis projects have been developed in the last 3 years focusing on petrology, hydrology, seismology, volcanology, sedimentology, structural geology, sedimentology, and stratigraphy along all Imbabura Geopark. These projects have been awarded in workshops and international conferences. Besides, Imbabura Geopark has been a wonderful natural laboratory and classroom. Thus, the professional curriculum of students incorporates several field trips to learn about the geological heritage but also to develop praxis in seismology, geophysics, and geochemistry methods. Regarding the conservation of flora and fauna, the community outreach projects have successfully empowered marginalized rural communities that through conservation develop new sources of income. Other research activities are solving problems such as insect control, reduction of eutrophication in the Geopark lagoons, and description of local species of birds. Further, Yachay Botanical Garden conserves 18000 native plant species a quarter of which are endemic to the Geopark's territory. Students from the biological and earth and science field have promoted multiple training courses and conferences to spread knowledge from academia to the public. In summary, a new generation of research has taken advantage of the opportunities that Imbabura Geopark brings. Yachay Tech University community promotes research and learning activities in collaboration with Imbabura Geopark, which successfully transmits the learnings to the community through engagement projects in the most popular tourist attractions and vulnerable habitats. The geological heritage and biodiversity in the geopark open a unique opportunity to develop investigations by young researchers, and the dissemination of the knowledge has multiplied the enthusiasm and support for the Geopark in the last years.

**Keywords:** Geopark, Imbabura, Research, Geology, Conservation

**Corresponding author:** p.rengel@khu.ac.kr

**Reference:**

## A Digital Approach to Geoconservation Inventorying in the Wellington Park, Tasmania

Mark WILLIAMS<sup>1\*</sup>, Melinda MCHENRY<sup>1</sup>,

University of Tasmania<sup>1</sup> Australia, University of Tasmania<sup>1</sup> Australia

Tasmania has a billion-year-long geo-climatic history and extensive tectonic activity into the Paleogene – Neogene, and many of Tasmania’s prospective large-area geosites are of significant scientific value at a national or international level. The Tasmanian exposure of Jurassic dolerite (diabase) at the land surface is the most extensive in the world, and the Wellington Park, doleritic and basaltic exposures, organic soils, and extensive sedimentary sequences are incorporated into a large, state-significant listing of periglacial terrain that has never been glaciated. A UNESCO Geopark is an international instrument that supports Geoconservation and Geotourism, yet Tasmania and Australia do not have UNESCO Global Geoparks to conserve important geodiversity outside World Heritage sites. Further, a lack of digital tools to support the inventory, planning and conservation processes have been identified as key barriers to geoconservation. Problems arise in the assessment and communication of inventory due in part to inconsistent and traditionally time-consuming, ‘snapshot’ assessments that are difficult to spatially monitor. The case study of kunanyi/Mount Wellington and the encompassing IUCN Category II Wellington Park in Tasmania, Australia was chosen to explore the complexities of geosite and geodiversity site assessment, detection and communication using digital tools. Using digital tools, we revised a 25-year-old snapshot inventory, configuring the ESRI ‘Collector for ArcGIS’ app for in-field data collection. Putative geosite and geodiversity site attributes were assessed for scientific value, potential touristic use, and potential educational use, and additional digital tools supported spatially accurate, engaging, and interactive online inventory. This digital approach could assist Geopark managers and geoconservationists to monitor, protect and communicate inventory over the long-term.

**Keywords:** Tasmania, Mobile-GIS, Inventory, Dolerite, Periglacial

**Corresponding author:** mark.williams@utas.edu.au

**Reference:**

Williams MA, McHenry MT (2021) Tasmanian reserve geoconservation inventory assessment using Geographic Information Technology (GIT). Int J Geoheritage Park. <https://doi.org/https://doi.org/10.1016/j.ijgeop.2021.05.001>

## Scale issues for UAV 3D mapping: The case of Lesvos Geopark

*Ermioni Eirini PAPAPOULOU<sup>1\*</sup>, Nickolas ZOUROS<sup>1</sup>, Georgios TATARIS<sup>1</sup>, Athanasia CHRONI<sup>1</sup>, Nikolaos SOULAKELLIS<sup>1</sup>,  
UNIVERSITY OF AEGEAN<sup>1</sup> Greece, UNIVERSITY OF AEGEAN<sup>1</sup> Greece, UNIVERSITY OF AEGEAN<sup>1</sup> Greece,  
UNIVERSITY OF AEGEAN<sup>1</sup> Greece, UNIVERSITY OF AEGEAN<sup>1</sup> Greece*

A geopark can be consisted of many individual geosites of different geographic scale and the categorization of them according to cartographic scale is necessary for their 3D mapping. A characteristic example of this kind of geoparks is the Lesvos island UNESCO Global Geopark, which is constituted by a large number of unique geosites whose geographical scale vary. Since every geographic scale is directly connected with the cartographic scale in which every geosite is captured and geovisualised; specifying the desired cartographic scale is essential in the Unmanned Aerial Vehicle (UAV) 3D mapping, as it comprises the basis for the design of data acquisition. The aim of this study is to investigate the scale issues for the 3D mapping of a geosite in Lesvos Geopark, at the northeastern Aegean, Greece. The contribution of this research is the correlation of the geographic and cartographic scale, in association with UAV flight parameters such as GSD, altitude, gimbal pitch, orientation and overlapping (front and side). Especially, a total of 150; geosites of Lesvos Geopark are being studied for the determination of the flight parameters of three different UAVs (Inspire 2, Phantom 4 Pro and Mavic Pro). The collection of Very High Resolution (VHR) photos, suitable for the generation of 3D cartographic products, was the main goal; while the methodology followed to accomplish this, it consists of five main stages: i) determination of the geographical scale of each geosite, ii) definition of the cartographic scale of all geosites, iii) computation of GSD based on cartographic scale, iv) calculation of UAV flight altitude and flight characteristics and v) classification of geosites based on the parameters for their 3D mapping. The results of this study showed five geographic (G1: < 0.1 ha, G2: 0.1 – 1 ha, G3: 1 – 10 ha, G4: 10 – 100 ha, G5: > 100 ha) and cartographic (C1: > 1:50, C2: 1:50 – 1:100, C3: 1:100 - 1:250, C4: 1:250 - 1:500, C5: < 1:500) categories which derived by the size of the geosites. Combining these two scales, the characteristics of the flights for the collection of VHR photos can be arisen. In conclusion, the classification of the geosites of Lesvos island in five cartographic scales leads to fast and optimal capture of VHR photos required for the 3D mapping of them.

**Keywords:** Lesvos Geopark, geosites, scale, 3d mapping, UAV

**Corresponding author:** epapa@geo.aegean.gr

**Reference:**

Lesvos island UNESCO Global Geopark



---

# Workshop

December 15

---





## How we started working on #ESDfor2030

*José María BARRERA<sup>1\*</sup>, Iván CORTUJO<sup>2</sup>, Emilia ROMÁN<sup>3</sup>,  
Villuercas Ibores Jara UNESCO Global Geopark<sup>1</sup> Spain, Villuercas Ibores Jara UGGp<sup>2</sup> Spain,  
Directorate General for Education, Extremadura, Spain.<sup>3</sup> Spain*

Villuercas-Ibores-Jara UNESCO Global Geopark is in the region of Extremadura, one of the autonomous communities of Spain. Its educational project has an experience of more than ten years, being the continued support of the General Directorate for Education of the Government of Extremadura one of its keys to success. The work in the educational centres –called Geocentres- with students and teachers added to their capacity for cooperation and to the learning about local heritage constitute the basement on which all courses built new educational activities. They culminate with a special day, at the end of the school year, in which students, teachers and society share the advances and innovations developed. Some of them are described in the article. This experience has constituted the substrate to integrate the objectives and competences of the Education for Sustainable Development expressed in the new UNESCO framework ESD for 2030. Also to expand this experience to other UNESCO territories, specifically Biosphere Reserves and World Heritage. The determined support of the educational authorities seeks, from here, to be able to reach all the educational centres of Extremadura through technical conferences and the support of the Educational Programs Units and the Teacher and Resources Centres (coordination and support units). The common lines of work include the exchange of good practices, teacher training and the inclusion of ESD in the school curriculum so that the SDGs are a subject of lifelong learning.

**Keywords:** Villuercas-Ibores-Jara, EDS, Extremadura, Workshop on Education

**Corresponding author:** [jmbarrera@dip-caceres.es](mailto:jmbarrera@dip-caceres.es)

**Reference:**

## SDG-Geocache project to promote Agenda 2030 regionally

*Sandra TEUBER<sup>1\*</sup>,  
UGGp Swabian Alb<sup>1</sup> Germany*

Submission for ESD-workshop of José Maria Barrera Crises such as climate change, soil erosion, biodiversity loss, hunger and poverty are threatening global societies and can only be mastered together. Thus, the 2030 Agenda with its 17 Sustainable Development Goals (SDGs) was developed to provide guidance to people worldwide in their strive for sustainable development. Based on the idea of a steering group within one of the counties of the UGGp Swabian Alb, the office of the UGGP developed an SDG-Geocache project to illustrate the relevance of each of the 17 SDGs to the local population. This project was then implemented by and within the county of Reutlingen. However, the concept was developed in a way that it can be applied to other regions. The individual caches are clearly visible within the landscape, which is a different approach than in the usual geocaching projects. However, everyone who passes a cache can stop and access it, solve the riddle and enter their names in the log book. Through this, everyone can playfully explore the 17 SDGs as each of the 17 geocaches covers one of the SDGs. Further, the individual caches are all located in a region relevant to the achievement of the respective SDG, so that people understand the value of the SDG for their everyday life. The geocache for SDG 6, for example, is located at a volcanic vent, which originates in the Tertiary, when the so called Swabian Volcano was active on the karstic landscape we now call Swabian Alb. On the karst landscape, water quickly infiltrates in the lime stone. However, on the areas shaped by volcanic activity, precipitation is retained. Thus, people in the past settled around these volcanic regions and used the rain water available there. However, the water quality was poor leading to high child-mortality. This is illustrated with the geocache where one has to take out a tube filled with water, sand, silt and clay. During this process, the water and sediment are disturbed. Thus, one has to wait for the sediment to settle before one can complete the geocache. This shows the amount of time it takes for sediment to settle in water. It also illustrates that the SDGs are relevant to everyone around the globe, as access to clean water was not available on the Swabian Alb a few generations ago. While it is a human right today, on a global scale much has to be done in order to reach this goal. With the SDG-Geocache project the UGGp raises awareness for the SDGs in a playful way. This is meant to engage as many people as possible within the region and show them the importance of the SDGs for humanity.

**Keywords:** 2030 Agenda, SDG, geocaching

**Corresponding author:** teuber@geopark-alb.de

**Reference:**

<https://sdgs.un.org/2030agenda>

---

## Example of Online Youth Workshops

---

*Naomi FOSTER<sup>1\*</sup>,  
North Pennines AONB and UGGp<sup>1</sup> United Kingdom*

---

During a national lockdown early this year, staff at the North Pennines AONB and UNESCO Global Geopark ran online workshops for youth groups themed around geology and landscape. Naomi will talk about what they did, how this worked, why she's been using up red sugar for the past 9 months, and maybe demonstrate some of the activities. Be prepared to join in.

---

**Keywords:** Education, Youth, Online, Learning, Active

**Corresponding author:** [naomi@northpenninesaonb.org.uk](mailto:naomi@northpenninesaonb.org.uk)

**Reference:**

---

## Volunteers for the Geopark. Hybrid educational activities during the pandemic

*Cristian CIOBANU<sup>1\*</sup>, Maria Luiza CRETESCU<sup>1</sup>,*

*University of Bucharest - Hateg Country UGG<sup>1</sup> Romania, University of Bucharest - Hateg Country UGG<sup>1</sup> Romania*

“Volunteers for the Geopark” is a program created in 2013 by the Hațeg Country UNESCO Global Geopark – University of Bucharest and addressed especially to local youth from the geopark’s communities. In its eight years of existence, the program saw 320 enlisted volunteers, national prizes, tens of projects and hundreds of actions for the visitors and the community. Most of the volunteers’ work is finding ways to celebrate and interpret heritage, to reach out to visitors and the locals, to create places and times where/when people meet and enjoy the geopark experience. However, in the last two years the COVID-19 Pandemic came with many difficulties for the volunteers to achieve their objectives and even for the basic functionality of the program itself. Projects were stopped, offices were closed, activities were restarted only to be halted again when a new infection wave arrived. In these uncertain times the geopark staff and volunteers had to find solutions to keep going. We will focus on presenting three directions of action, the particular activities and the concrete way in which they were effective.

1. Building awareness. In normal times, the volunteers were the “messengers” responsible to design ways to transmit information about key issues like climate change or natural hazards. In 2020, when we were directly facing a global problem, a series of actions were directed towards the community, especially during the lockdown (March - July). The purpose was to confirm trust and to build hope. In 2021 the focus was set on how to reconfigure the tools in order to send the usual messages adapted to the new reality.
2. Creating connections. The volunteer program is about collaborating, building a team and connect to other youth groups, especially in the geopark networks. During the pandemic many networking projects were cancelled, but some were carried out successfully in 2021. For six months two German volunteers joined the Hațeg team through the UNESCO Germany Kulturweit program. Connecting with other geopark youth groups was done online, with many opportunities being created. For example, the exchange with Hong Kong UGG was done using an innovative educational online methodology.
3. Adapting to tourism changes. Volunteer actions are usually directed also towards maintaining and improving the interpretation infrastructure and services. In this period, the youth volunteers were the spearhead towards finding innovative ways to interpret heritage. The results were remarkable: volunteer guides were trained to sustain the increased number of visiting groups and new thematic trails were interpreted using creative solutions like Geocaching.

**Keywords:** geoeducation, volunteering, youth, heritage interpretation, pandemic

**Corresponding author:** cristian.ciobanu@unibuc.ro

**Reference:** Andrașanu, A. (2015). Geoconservation and interpretation. Unpublished manuscript Ciobanu, C. (2016). Space and Time Perception and the Geopark’s Communities. From Mythical Geography to Heritage Interpretation. International Review of Social Research. Volum 6, Nr. 2. Available online:

[https://www.degruyter.com/view/j/irsr.2016.6.issue-2/irsr-2016-0013/irsr-2016-0013.xml?format=INTIstrate, L., Baciuc, V. \(2015\).](https://www.degruyter.com/view/j/irsr.2016.6.issue-2/irsr-2016-0013/irsr-2016-0013.xml?format=INTIstrate, L., Baciuc, V. (2015).)

Voluntariatul pentru Natura. Studiu. Available online:

<http://voluntariatnatura.ro/downloads/Voluntariatul%20pentru%20natura.pdf> Martini, G., (2009), Geoparks... A Vision for the Future, Revista do Instituto de Geociências – USP. v. 5, p. 85-90. UNESCO. (2016). UNESCO Global Geoparks. Paris

## Geoeducation during the lockdown – the case study from the Center of Geoeducation, Holy Cross Mts. UGGp, Poland

*Witold WESOŁOWSKI<sup>1\*</sup>, Michał POROS<sup>1</sup>, Martyna SUTOWICZ-KWIECIŃSKA<sup>1</sup>,*

*The Holy Cross Mountains UGGp<sup>1</sup> Poland, The Holy Cross Mountains UGGp<sup>1</sup> Poland, The Holy Cross Mountains UGGp<sup>1</sup> Poland*

The Geoeducation Center in Kielce is the heart of the Holy Cross Mountains UNESCO Global Geopark. The facility was opened in 2012. From the beginning of the operation of this institution, its activity was focused on promoting the geology – guided tours of the main exhibition, workshops or lectures and field trips. The situation changed in March 2020, when the first case of SARS-CoV-2 infection was recorded in Poland. The risk related to the spread of the virus was the basis for the Polish government to introduce restrictions related to, i.a. with the movement and gathering of people as well as the activities of schools, cultural facilities or science and education centers. The standard activities of the Center were then discontinued, and in extreme cases, in March-May and November-December 2020, the facility was completely closed to visitors. The new situation forced us to introduce alternative forms of activity focusing on online education. Among the most important educational activities carried out in March-December 2020 and January-February 2021 were classes, meetings and online presentations for children, adolescents and adults conducted as part of the cycles: "Geology Enthusiasts Club - online", "GEO-THURSDAY online" and "GEO-SCHOOL online". The short films from the series "The Holy Cross Mts. Geopark - geotourism on the trail" posted on Facebook and YouTube were very popular among the audience. This formula turned out to be the most popular among our recipients and survived until 2021 as one of the most effective forms of promotion and popularization of knowledge about the geological heritage of our geopark. On the other hand, due to the prolonged online activity, we have also noticed negative phenomena, such as the increasing lack of interest and commitment of our audience. This problem mainly concerned online lessons aimed at children and adolescents. Attempts to solve this problem by activating students through various types of quizzes or competitions did not bring satisfactory results. Therefore, in the periods when it was possible to conduct outdoor activities, we implemented an offer of educational walks for small groups. In 2021, the epidemic situation has not changed for better and we still have restrictions related to the inability to organize educational workshops or visiting the exhibition with a guide. The answer to these challenges is the use of opportunities offered by modern mobile tools (e.g. smartphone application, virtual guide to the exhibition), as well as non-standard solutions for the safe handling of tourist traffic (e.g. visiting the exhibition in the form of a self-service educational game). The verification and improvement of these ideas during the operation of our facility in 2021 allowed us to introduce them as a permanent element of the Center offer. Due to the well reception among recipients, these solutions may also be used in the future when the Center returns to "normal" operation.

**Keywords:** Holy Cross Mts. UGGp, geoeducation, lockdown, online activity

**Corresponding author:** [witold.wesolowski@geopark.pl](mailto:witold.wesolowski@geopark.pl)

**Reference:**

## Geological times step by step

*Clément CAZÉ<sup>1\*</sup>, Tanguy LEBLANC<sup>1</sup>,*

*Beaujolais UGGp - Syndicat Mixte du Beaujolais<sup>1</sup> France, Beaujolais UGGp - Syndicat Mixte du Beaujolais<sup>1</sup> France*

The age of the Earth, the length of dinosaurs age, or even the time since the last ice age are very abstract measurements on our human scale. The temporal gigantism in geology is difficult to appreciate for children as for adults. In the school of Montmelas village, within the Beaujolais UNESCO Global Geopark, the educational approach was to teach geological time by creating a nature trail materializing the temporal measures. The trail project is based on a network of trails already set up by schoolchildren in the same area. The six already existing courses were created by the childs, for themselves as well as for the general public. In all, six routes offer six different angles of approach to the Montmelas environment (fauna, flora, poetry, landscape, etc.). The geological route is superimposed on the present nature trail. The objective of the Montmelas geological trail is to raise awareness of geological times through walking. The trail is laid out on a time scale where one meter traveled corresponds to four million years, for a course of approximately 1.4 km. Ten information panels mark the key moments in the geological history of the Earth and the Beaujolais, such as the emergence of life, the appearance of the first animals or the Alps formation. Thus, schoolchildren and visitors walk relatively longer between Precambrian events (formation of the Earth, the Moon, birth of tectonic plates, etc.), hundreds of meters apart, than between panels representing the last 500 millions of years apart, just a few meters apart. Strolling along the path then allows us to measure the place of the geological history of the four recent geological eras (Primary, Secondary, etc.) in the chronology of planet Earth. In parallel with the panels positioning the major stages in the history of the Earth and living things, four panels provide information on the rocks encountered on the route, in this case a sandstone, a dolerite, a microgranite, as well as a micaschist. The geodiversity visible on Montmelas provides an example for each of the major rock classes (magmatic, metamorphic and sedimentary). The childs learning of geological concepts, geological time in particular, began with the realization of a first time line in class. The line, materialized by a wire stretched in the classroom, symbolizes the history of the Earth. It is enriched during the school year by geological events, in the form of images, which the pupils have chosen for the geological path.

**Keywords:** geological times, schools, education

**Corresponding author:** [ccaze@pays-beaujolais.com](mailto:ccaze@pays-beaujolais.com)

**Reference:**

## TeachOUT

### – A Mobile Application for Educational Activities in UNESCO Global Geoparks

*Nina ERJAVEC<sup>1\*</sup>,*

*Idrija Tourism Board<sup>1</sup> Slovenia*

Since the establishment of the Idrija UNESCO Global Geopark, education, cooperation with educational institutions, and a modern interpretation of natural and cultural heritage have been among the Geopark's principal goals. In the years since its beginning, the Geopark team has developed educational activities that connect urban and rural areas and are based on experiential learning (most frequently taking place in nature), an innovative interpretation of heritage, and inclusion of different providers of tourism products or services. An important tool developed by the Idrija UNESCO Global Geopark in cooperation with partners from Norway, Portugal, and Iceland within the framework of the European ESTEAM project, is TeachOUT, an educational application based on an analysis of national curricula and the needs of teachers and students from different European countries. The application is a significant upgrade of the traditional guided educational programs in geoparks, as it allows users to create their own exercises and include various multisensory elements such as scavenger hunts, quizzes, and exercises focusing on observation, listening, photography, and cartography. By using a smart device and its GPS, the user follows the application from point to point, resolving a number of tasks and challenges along the way. Today, TeachOUT is an integral part of educational programs in the Idrija UNESCO Global Geopark, and is used by over 400 educational workers from all over Europe. Because of its wide range of use and its user-friendly interface that allows the creation of new content, the educational application is also useful for experts dealing with the development and implementation of educational activities in UNESCO Global Geoparks all over the world. In order to disseminate the application within the European and Global Networks of UNESCO Global Geoparks and among other users, the Idrija UNESCO Global Geopark and its project partners have developed materials that allow users to independently familiarize themselves with the application and the CMS system on which the app is based. With TeachOUT, users can independently upgrade existing thematic or educational trails in geoparks or even create brand new ones.

**Keywords:** education, geoparks, ICT, mobile application, TeachOUT

**Corresponding author:** nina.erjavec@visit-idrija.si

**Reference:**

## Escape Later, Learn Now: A Digital Escape Room About The Geopark's Heritage

*Iván CORTIJO<sup>1\*</sup>, José María BARRERA<sup>1</sup>,*

*Villuercas-Ibores-Jara UNESCO Global Geopark<sup>1</sup> Spain, Villuercas-Ibores-Jara UNESCO Global Geopark<sup>1</sup> Spain*

The educational project of Villuercas-Ibores-Jara UNESCO Global Geopark, in the region of Extremadura, Spain, has an experience of more than ten years, having the continued support of the General Directorate for Education of the Government of Extremadura. During last year's confinement, both teachers and students encountered difficulties in following the normal course of the classes. Continuing with the gamification experiences, a tool of proven usefulness in teaching, the educational working group decided to create a virtual escape room with the theme of the geopark to motivate them and offer them an educational tool that did not exist among their materials. With an estimated duration of 50 minutes (the duration of a class) and two levels of difficulty, up to and from 10 years of age, the tests cover from the geopark fossils to their food products (such as honey), giving an overview of its heritage in a fun way that encourages their interest. The objective of this escape room is to help schools innovate, fostering the creativity of teachers and students, providing ubiquity to their educational materials and facilitating their recognition and differentiation in society. In addition, once tested in the educational centers, it will be put on the new geopark website, becoming one more attraction for tourists before, during and after their (your) visit. May the knowledge be with you!

**Keywords:** Villuercas-Ibores-Jara, Extremadura, Gamification, Escape room

**Corresponding author:** [icortijo@dip-caceres.es](mailto:icortijo@dip-caceres.es)

**Reference:**

## Educational Online Games: Connecting With The Geopark

Luis MAMPEL<sup>1\*</sup>, Ángel HERNÁNDEZ<sup>2</sup>,

*Fundación Conjunto Paleontológico de Teruel-Dinópolis, Maestrazgo Cultural Park UNESCO Global Geopark, Spain<sup>1</sup> Spain,*

*Maestrazgo Cultural Park UGGp, Spain<sup>2</sup> Spain*

The Maestrazgo Cultural Park UGGp (Spain) is located within the Aragonese western branch of the Iberian Mountain Range that was formed during the Alpine Orogeny, on the border with the Ebro depression and in the confluence zone with the Coastal-Catalan Chain. It is characterized by a wide and varied number of stratigraphic formations from the Mesozoic and Cenozoic, both deposited in marine platform environments and in transitional and continental environments, that contains a very complete sedimentary and palaeontological record of the last 200 million years. The landscapes of the Geopark provide a natural laboratory of interest that helps teaching a wide range of skills, develop experiences within natural environment and learn scientific concepts in contact with direct examples, among others: 4 Natural Monuments (Red Natural de Aragón), 67 Geosites, 76 Dinosaur's sites including declared Assests of Cultural Interest (BIC) and two sections of the Dinópolis Museum. The reality imposed due to COVID-19 pandemic has taught us new ways to work and cooperate online. Thus, in addition to face-to-face activities, it has been necessary to introduce new digital formats to promote the teaching learning process of cultural and natural values highlighting its geodiversity in a transversal way.

In this context was developed the game "The treasures of the Maestrazgo Geopark" through a free online platform (Mobbyt) compatible with PC and tablet / smartphone (IOS, ANDROID) to learn about some iconic territorial elements on non-formal education context. The target group is Lower Secondary Education (2011-International Standard Classification of Education, UNESCO), children that live or are directly related with the reality of the Geopark. Nevertheless professionals (teachers) and general public can appreciate the game due that is a didactic instrument that allows teaching and learn playfully through a series of questions accompanied by photographs and personalized diagrams and two game modalities: quiz (trivia) or racing board game.

The game is free and available online (Spanish and English versions) on:

<https://mobbyt.com/videojuego/educativo/?Id=259492> (EN)

<https://mobbyt.com/videojuego/educativo/?Id=36210> (ES)

Acknowledgments: Departamento de Educación, Cultura y Deporte (Gobierno de Aragón), Research Group E04\_20R FOCONTUR financed by the Departamento de Ciencia, Universidad y Sociedad del Conocimiento (Gobierno de Aragón) and FEDER funds "Construyendo Europa desde Aragón", Instituto Aragonés de Fomento (IAF), Dinópolis, Unidad de Paleontología de Dinosaurios de Teruel (Ministerio de Ciencia e Innovación).

**Keywords:** Maestrazgo-Cultural-Park, Geopark, Geodiversity, Non-formal education, Online game

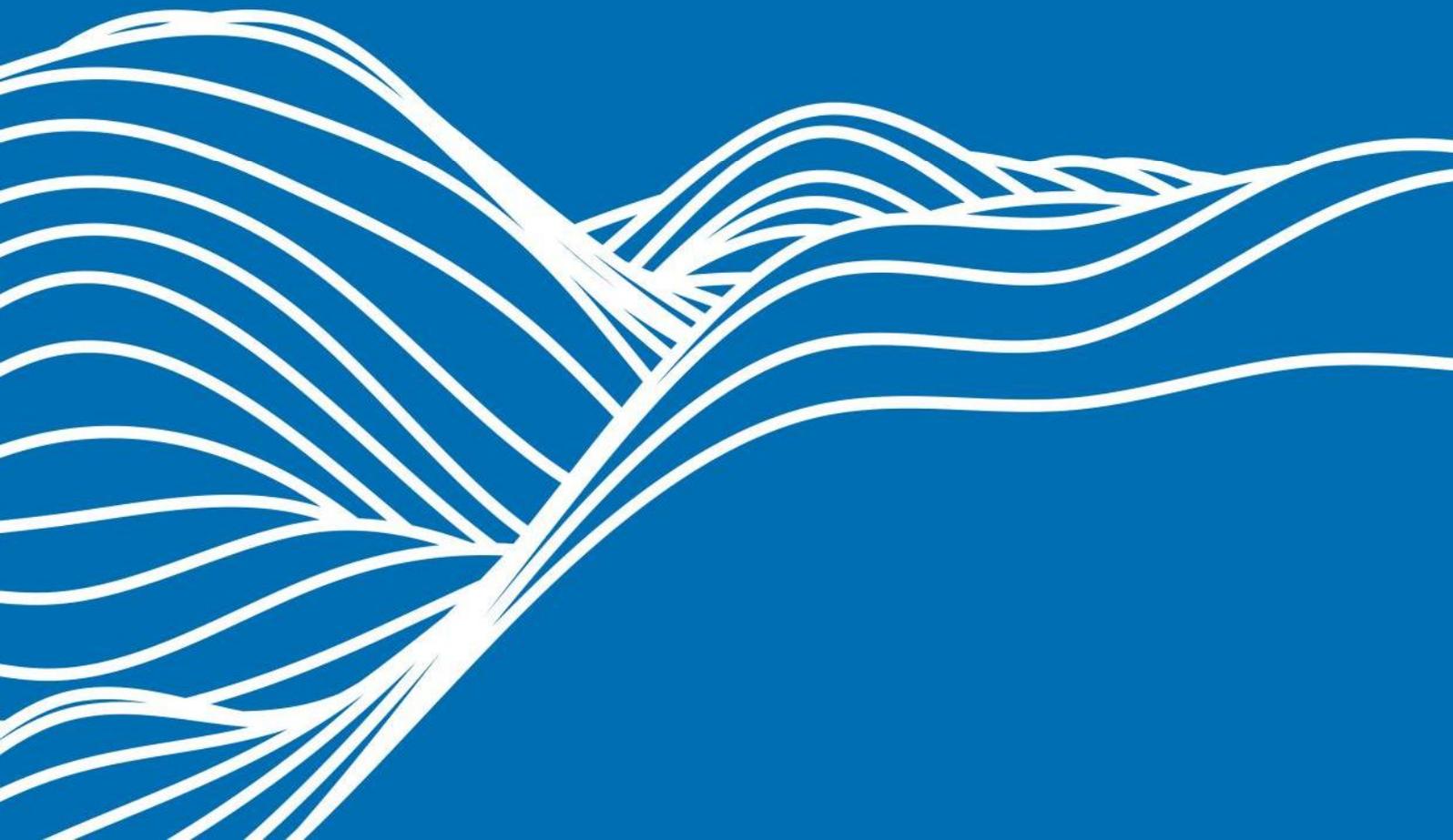
**Corresponding author:** [mampel@fundaciondinopolis.org](mailto:mampel@fundaciondinopolis.org)

**Reference:** Alcalá, L., Mampel, L. & Hernández, A. (2015). El Geoparque del Maestrazgo (Maestrazgo Cultural European & Global Geopark). In: A. Hilaro, M. Mendia, M. Monge, E. Fernández, J. Vegas, A. Belmonte (eds.). Patrimonio geológico y Geoparques, avances de un camino para todos. Instituto Geológico y Minero de España, Cuadernos del Museo Geominero, 18: 529-534. Mampel, L. & Hernández, A. (2016). Guía Turística del Geoparque del Maestrazgo (Geoparque Mundial de la UNESCO). Teruel: Asociación Parque Cultural del Maestrazgo. 131 p. Simón, J.L., Mampel, L. & Mallén, L. (2011). Lugares de interés geológico y paleontológico del Maestrazgo. El Patrimonio Físico (3). Centro de Estudios del Maestrazgo Turolense. 189 p.



DIGITAL 9<sup>th</sup> International Conference  
on UNESCO Global Geoparks

# Poster Abstracts





## Yanqing UNESCO Global Geopark Fight Against Corona Virus

Li YUNQIAN<sup>1\*</sup>,

Yanqing UNESCO Global Geopark<sup>1</sup> China

In early 2020, a sudden COVID-19 broke the normal life of people. Up to now, COVID-19 is still raging, and we are gradually adapting to the new life style coexisting with COVID-19. The protection consciousness has rooted in our hearts, and epidemic prevention measures are always unremitting. In the face of epidemic situation, Yanqing UGGp actively participates in epidemic prevention, publicizes epidemic prevention knowledge, and carries out a series of online and offline popular science publicity activities to contribute to the development of community and economy. Promoting epidemic prevention knowledge to enhance self-prevention conscious. Yanqing UGGp hands out the books and leaflets of preventing COVID-19 for visitors, reminds visitors of epidemic prevention precautions in the form of slogans and posters. Strengthening safety awareness and paying close attention to epidemic prevention. Yanqing Geopark Museum and Global Geopark clean up public areas and disinfect them regularly. At the beginning of the epidemic, Yanqing Geopark Museum and Global Geopark were all temporarily closed. After the opening is restored, the measures of code scanning, temperature measurement and registration have been implemented until now, and masks should be worn throughout the visit. Participating in community epidemic prevention and help residents solve difficulties. The staff went into the community to publicize epidemic prevention knowledge, put up publicity slogans, guided the personnel on duty to use electricity safely and thermometers correctly, strictly prevented intersections and fought the epidemic with residents. Carrying out diversified popular science activities to perform the functions of geopark normally. On WeChat platform, Yanqing UGGp opened the popular science column of "Yanqing UGGp popular science books – time travel of dinosaurs" and "popular science tips of Yanqing UGGp", carried out interactive activities on line in World Earth Day. On the premise of doing a good job in epidemic prevention measures, Yanqing UGGp carried out a series of offline popular science activities of "Knowing and loving my hometown - We live in the Global Geopark". The staff went into communities, schools, enterprises and institutions to publicize Yanqing UGGp; Regular popular science lectures are held in Qianjiadian geological popular science school.

**Keywords:** Global Geopark, epidemic prevention, popular science publicity

**Corresponding author:** yanqingsjdzgy@163.com

**Reference:**

## Introducing Indigenous Ainu Language with Picture Book "Origins of River Names of Toya-Usu UGGp"

*Nire KAGAYA<sup>1\*</sup>,  
Toya-Usu UGGp Council<sup>1</sup> Japan*

The indigenous people of the Hokkaido region in Japan are the Ainu people. There are communities of Ainu people, and the cultural tradition activities have been continued in the area of Toya-Usu UGGp. It is one of the role of the UNESCO global gepark to support cultural preservation of the indigenous culture and language. Even today, many Ainu-derived place names exist in the Toya-Usu UGGp. The parts of the geopark's name "Toya" and "Usu" are also named by Ainu language. We consider that the local Ainu language names are culturally important, that should be protected and handed down to future generations. The Toya-Usu UGGp published the picture book "Origins of River Names of Toya-Usu UNESCO Global Geopark" in December 2020. We drafted a story that we travel our Geopark while looking for these river names' origins. With 23 rivers with Ainu-origin names, you can learn about the earth, the ecosystem, and the life of people. It is designed to be easy to read with cute illustrations. Through this project, we realize place names are important archives which were passed down through history to today by indigenous people. We have been distributing this picture book to, for example, schoolchildren studying Ainu culture. We also held events to explain the story of this book. We hope that school teachers and Geopark Guides share the stories of this book with children and tourists. If you are interested in the contents of this picture book, we share it for you on a poster presentation so that you can read the contents carefully.

**Keywords:** Indigenous people, indigenous language, Picture book, Intangible cultural heritage, Place name

**Corresponding author:** [kagaya.nire@town.toyako.hokkaido.jp](mailto:kagaya.nire@town.toyako.hokkaido.jp)

**Reference:**

<https://www.toya-usu-geopark.org/english/>

## The Nanki Kumano Geopark Junior Research Team and Students' Scientific Study of Marine Plastics Issues

Yutaka OKAZAKI<sup>1\*</sup>,  
Wakayama University, Japan<sup>1</sup> Japan

Nanki Kumano Geopark was established in 2014 as one of the Japan Geopark Networks. The territory of Nanki Kumano Geopark is an area facing the ocean located at the southernmost tip of the Kii Peninsula in Honshu, central Japan. It consists of 9 municipalities in Wakayama Prefecture and part of Totsukawa Village in Nara Prefecture. In order to smoothly promote geosite conservation activities and regional economic activities in the future, the education program on the geopark for the younger generation is crucial. Therefore, in collaboration with local students, we have organized the "Nanki Kumano Geopark Junior Research Team" this time. This research team is supported not only by the school teachers who belong to but also by research experts in the fields of geology, environmental science and education as well as the secretariats, and is able to directly consult with researchers regarding the research subject. It is a mechanism that not only acquires knowledge, but also conducts observation and analysis in the field based on the actual field survey method as active learning, and then conducts analytical research based on the research issues that each member has. In this time, we went out to the beach and conducted fieldwork to investigate anthropogenic waste including marine plastic as a research subject. This field work was not just a cleanup operation but a research activity to investigate marine plastic waste. Such a learning process that encourages such students' autonomous curiosity motivation, has already become a major issue in education internationally. In recent years, it has been incorporated as an issue in primary and secondary education processes in Japan as well. In addition, these efforts can be positioned as educational practices for UNESCO Associated School activities aimed at achieving the goals of the SDGs. Through these efforts, we will contribute to nurture next-generation human resources who will support the geopark activities in the future, in addition, we would like to widely share such experiences and know-how with other geoparks such as UGG.

**Keywords:** ESD, SDGs, Geopark Junior Research Team, Marine Plastics

**Corresponding author:** yutakaok@wakayama-u.ac.jp

**Reference:**

<https://nankikumanogeo.jp>

## Langkawi UNESCO Global Geopark GeoEducation Programme

*Furzannie HANNA<sup>1\*</sup>,  
Langkawi Development Authority<sup>1</sup> Malaysia*

Langkawi was awarded UNESCO Global Geopark status in 2007 making it the first Global Geopark in Southeast Asia. To date it is one of a select 169 geoparks recognised as such worldwide. Langkawi UNESCO Global Geopark (LUGGp) includes the Machinchang Cambrian Geoforest Park, Kilim Karst Geoforest Park, Dayang Bunting Marble Geoforest Park, and Kubang Badak BioGeo Trail. Each of these geoforest parks showcases significant geological, biological and cultural heritage consisting of ancient rock formations and dramatic mountain peaks to an abundance of flora and fauna species. Following this the GeoEducation Programme was introduced soon after with the mandate to develop and sustain LUGGp via impact-driven programmes, GeoEducation continues to inspire and inform the community about the environmental conservation of the Geopark.

### OBJECTIVE

The purpose of the study is to measure the impact of geoeducation on local schools and society at large via cultural conversation and community engagement.

### ACTIVITIES

Schools from across Malaysia were invited to Langkawi UNESCO Global Geopark (LUGGp) to ensure the geoheritage, cultural conversation and community engagement to ensure conservation efforts and preservation of the LUGGp via Geopark to School and School to Geopark.

### RESULTS

According to the study GeoEducation is necessary in inspiring and informing the community on the importance of environmental conservation of the Geopark.

### ANALYSIS

The School to Geopark Program was created by Geopark Department of LADA. The aim of this programme is to educate the younger generation of Langkawi to discover the value and importance of preserving Langkawi Geopark heritage and conservation efforts crucial in ensuring the future sustainability of these natural marvels of nature and the wildlife ecosystem it protects. Geopark to School is an outdoor classroom concept that focuses on giving inspirational and educational talks on the Geopark to bright young minds who as locals will inherit the legacy of these geoparks. This programme is designed to share valuable information and geopark knowledge as well as first hand knowledge by experts in the field to students in Langkawi, Malaysia and even countries within the region.

### CONCLUSION

In conclusion although the numbers of participants may have decreased due to the impact of the pandemic in 2020 efforts are still being carried out in targeting schools especially as we wish to cultivate the roles and responsibilities of the future generation in maintaining and ensuring the safety and conservation of Langkawi UNESCO Global Geopark.

**Keywords:** Langkawi, GeoEducation, Geopark to School, School to Geopark

**Corresponding author:** hanna@lada.gov.my

**Reference:** Sustainable Development Goal - 4

## Coast cleanup – from a small project to full financial backing from Norway's biggest private environmental fund

*Bjørn Magnus MOWINCKEL NILSEN NARUM<sup>1\*</sup>,  
Gea Norvegica UNESCO Global Geopark<sup>1</sup> Norway*

Gea Norvegica UGGp is situated in south-east Norway with a landscape comprised of mountains, woods, lakes, fjords and a long coastline. We work with projects in all these sceneries and in this talk you will be introduced to the history, development and implementation of our biggest project yet, cleaning marine environments along our coast. In 2017 Norwegians awareness of anthropogenic waste in marine habitats rose, due to a whale that was washed up on a beach with stomach contents mainly consisting of plastics. The story was everywhere and a group that early showed strong commitment was our youth. To keep this momentum and possibly influence our future decision makers, we decided to create an educational plastic cleanup project early in 2018 with funding from the Norwegian Environment Agency. Every spring and autumn hundreds of pupils from all parts of the geopark were brought out to polluted areas along our coast, to make a difference and learn about sustainability. After three successful years working on the project we were, due to our experience and commitment, contacted by the Norwegian Retailers' Environment Fund (NREF). NREF is running Norway's biggest professional plastic cleanup project with a goal to clean 40% of the coastline of Norway and Svalbard by the end of 2023. Initially our involvement was to help them map polluted areas along our coast for their cleanup campaign, but as they learned more about our project we were invited to attend their tender process. By fall 2021 it was announced that we got the contract and what started as a small educational project has now grown into a full-scale professional cleanup program, generating new jobs in the geopark. We are also able to implement our existing educational cleanup activities into the program, as one of very few companies supported by the NREF to do so.

**Keywords:** Project development, Sustainability, Cooperation, Education, Environment

**Corresponding author:** bjorn.narum@gearor.no

**Reference:**

## Preservation, Utilization and Future Tasks of Major Geosites in National Geoparks, KOREA

JUNG Seungho<sup>1\*</sup>,

*National Research Institute of Cultural Heritage, CHA<sup>1</sup> Republic of Korea*

In Korea, a total of 13 national geoparks including Jeju Island, and 4 global geoparks are under management through domestic and international certification procedures (as of 2021). Now that 10 years have passed since the first national geopark was certified in 2012, and it has achieved remarkable quantitative growth and publicity, We would like to look back on the current situation to supplement the deficiencies in the geopark operation system and to efficiently preserve and manage geosites. First, out of a total of 227 geological attraction sites presented by 13 national geoparks including Cheongsong, Mudeungsan, and Hantan River, 38.8% of the sites have already been managed as national cultural properties (natural monuments and scenic spots). In particular, in the case of Jeju Island, 10 out of 13 geological attraction sites (77%) are natural monuments including Hallasan Mountain, Manjanggul Cave and Shell Fossil Site of the Seogwipo Formation. In most local governments, the management authorities of the two fields (geological attractions and geoparks) are divided into the Culture (Tourism/Arts) Department and the Environment Department, respectively, so there must be a conflict between the two departments in terms of their works. This is because, unlike natural monuments and scenic spots that focus on conservation and management to maintain their high value as a natural heritage, geoparks focus on utilization. Second, since the geopark program has to prepare periodic certification procedures while developing and operating education and experience elements for the purpose of exchange and coexistence with local residents, geology-related specialists (regular workers) need to be recruited to increase the continuity of work and actively participate in communication with local residents. However, in most local governments, geopark managers are secured with a professional tenure system (contract workers), and thus, the recruiters face the reality that they cannot concentrate on their major fields only, but have to deal with various administrative tasks and make efforts to renew the contract at the same time. Third, in a situation where it is necessary to operate a program by reflecting the unique geological characteristics differentiated from other regions and strive for the sustainable use of geological attractions, it is possible to prioritize the convenience and accessibility of visitors, including wooden decks, stairs and observatories. It is feared that by excessively installing observatories, bridges or plank road, it may make a mistake that harms the original meaning and landscape of the natural heritage. Since nature cannot be restored to its original state once damaged, projects related to the development and utilization of surrounding areas need to be approached carefully by preparing clear standards through the participation of experts in various fields.

**Keywords:** Natural Heritage, Natural Monument, Geoparks, Preservation, Utilization

**Corresponding author:** jungsho@korea.kr

**Reference:** This study was carried out through the Research on Geological Diversity on the Korean peninsula and Natural Monument Fossil Sites (NRICH-2105-A15F-1) of the National Research Institute of Cultural Heritage, CHA.

## Innovative development of Qinling Zhongnanshan UNESCO Global Geopark

Shichao WANG<sup>1\*</sup>, Dongwei ZHANG<sup>1</sup>,

*Qinling Zhongnanshan UNESCO Global Geopark<sup>1</sup> China, Qinling Zhongnanshan UNESCO Global Geopark<sup>1</sup> China*

In recent years, Qinling Zhongnanshan UNESCO Global Geopark has made some beneficial attempts in science popularization and supporting communities, relying on the cultural deposits of the ancient capital Xi 'an and taking advantage of the national development strategy of "the Belt and Road". One is the perfection of popular science hardware facilities. The science popularization system including the geopark museum and characteristic satellite pavilion has been built. These "distinctive character" museums have realized the three-dimensional science popularization of geoparks, especially the vast geoparks. Second, the diversification of popular science means. New media is utilized to break the limitation of time and space and realize the cloud-oriented popular science activities for the public. Further expand and enrich the core of research travel products, and build a professional research travel brand based on the whole museum system, Qinling International Juvenile Camp and Qinling Nature School. Third, geoparks drive the revitalization of surrounding villages. The tourism route of "geoparks scenic spot & community garden village" has been opened, and geological tourism products with local characteristics have been designed to realize the panoramic experience of geoparks tourism. The geopark deeply excavates the regional characteristics and geological background of Xi 'an, fulfills the responsibilities of the global geopark, expands the social influence, improves the Geopark display, and makes the geopark really become the "window" of the publicity of the Qinling Mountains.

**Keywords:** geopark, science popularization, innovation

**Corresponding author:** sammerlee@163.com

**Reference:**

## Chances and vision on a new GEOPARK at the southern Dead Sea, Jordan

*Djamil AL-HALBOUNI<sup>1\*</sup>, Osama ALRABAYAH<sup>1</sup>, Lars RÜPKE<sup>1</sup>,*

*GEOMAR - Helmholtz Centre for Ocean Research<sup>1</sup> Germany, GEOMAR - Helmholtz Centre for Ocean Research<sup>1</sup> Germany,*

*GEOMAR - Helmholtz Centre for Ocean Research<sup>1</sup> Germany*

A vision on the establishment of a new GEOPARK in Jordan is given in this work. The suggested western limit of the park lies ca. 5 km eastwards of the center line of the Dead Sea, to the East it goes well beyond the shoreline of the Eastern Dead Sea, and includes a considerable part of the Moab mountains; towards the North it includes the Wadi Mujib Biosphere reserve with the Mujib Dam and the origin of the canyon at the plateau in the East, and towards the South it involves the heritage site Al-Karak city. The highlight of the park and the basis of its' creation form the sinkhole and subsidence features found along the SE shoreline of the Dead Sea near Ghor Al-Haditha, a geological heritage of international significance. Its recent and ongoing formation is related to the sharp regression of the lake level, making it a unique environment on Earth, influencing the local communities as well as attracting international researchers. The creation of such a park is aimed at a sustainable development by protection of the natural landscapes, eco-tourism through museums, guided walks, education by e.g. water resource management and workshops on hazard awareness. The park will thematically encompass the change that the regression of the Dead Sea, and the accompanying hazards have on the local population. A creation of such a space would be the forth in the Middle East, so an international reputation and visibility is guaranteed. A strong dedication to international scientific geo- and bioscience projects, will also be part of this GEOPARK initiative. Geologically, the park would encompass a variety of features from Cambrian (Umm Ishrin Sandstone), over Cretaceous (Kurnub, Ajlun and Belqa groups) up to the Quaternary deposits in alluvial fans and the recently exposed shoreline of the Dead Sea. This includes magmatic and sedimentary rocks, wadis and valleys, mountain areas, the recent salt karst system and the dynamic formation of stream-channels. The hydrogeology and geomorphology, i.e. the connection between erosion by water, dissolution of salt and landscape formation will be the main guiding theme that connects the Moab mountains with the Dead Sea rift valley through remote valleys, vegetated springs areas and traditionally living communities.

**Keywords:** Dead Sea, Geopark, Ghor Al-Haditha, Geomorphology, Subsidence

**Corresponding author:** dhalbouni@geomar.de

**Reference:**

## Study on the characteristics of karst in the Paser Regency, East Kalimantan, Indonesia as geopark area

*Jamaluddin JAMALUDDIN<sup>1\*</sup>, Michael WAGREICH<sup>2</sup>, Veronika KOUKAL<sup>2</sup>, Ikhwannur ADHA<sup>3</sup>, Iwan PRABOWO<sup>3</sup>, University of Vienna; STT Migas Balikpapan<sup>1</sup> Indonesia, University of Vienna<sup>2</sup> Austria, University of Vienna<sup>2</sup> Austria, STT Migas Balikpapan<sup>3</sup> Indonesia, STT Migas Balikpapan<sup>3</sup> Indonesia*

Karst is a peculiar form of the earth's surface generally characterized by closed depressions, surface drainage and caves. Karst is formed from the dissolution of rock substrate, mainly of limestone. Karst in the Paser Regency of Indonesia is one of the most famous karst areas known for its unique landscape. Researchers conduct aimed at the fields of ecological functions, educational and cultural functions, and economic functions. Potential regional development studies are carried out through the development of an area with a geopark concept. This present study aims to determine the characteristics of the karst at Paser Regency based on basic geology. The research method used is a qualitative method with a descriptive approach, a preliminary survey, and a literature study. Based on the geology, the karst area originated from the Upper Oligocene platform carbonates of the Berai Formation. This formation consists of diverse shallow-water limestone types with a wide range of textures and dominant skeletal components of large foraminifera, red algae, and corals. Deposition of the Berai Formation occurred in moderate- and high-energy shallow-marine conditions. Chemical analysis of 6 limestone samples with chemical composition changing from CaO : 53,47 %; SiO<sub>2</sub> ; 1,25 %; Al<sub>2</sub>O<sub>3</sub> + Fe<sub>2</sub>O<sub>3</sub> : 0,4 %; MgO : 1, 7 %; Fe<sub>2</sub>O<sub>3</sub> : 0,145 %; P : 0,05. The study underlines the importance of this karst area and the limestones as a resource, and indicates the necessity to characterize the current state and biases in exploiting this natural resource.

**Keywords:** Berai Formation, Geopark, Karst, Paser Regency., Indonesia

**Corresponding author:** jamaljamaluddin1994@gmail.com

**Reference:**

Gorog, A.J & Sinaga, M.H. (2008). A tarsier capture in montane forest on Borneo. In *Primates of the Oriental Night*. Indonesia, T.Mo.E.a.M.R.Ro., The Minister of Energy and Mineral Resources Kusri, M.D. & Bukhori, D. (2011). Laporan Akhir: Survey Keanekaragaman Hayati di Kawasan Karst Gunung Berai di Kalimantan Timur. The Nature Conservancy, Marshall, A. J., Salas, L. A., Stephens, S., Nardiyono, Engstrom, L., Meijaard, E. & Stanley, S. A. (2007). Use of Limestone Karst Forests by Bornean Orangutans (*Pongo pygmaeus morio*) in the Sangkulirang Peninsula, East Kalimantan, Indonesia. *American Journal of Primatology* 69: 1-8. P. W. Williams. (2008). The role of the epikarst in karst and cave hydrogeology: a review. *Int. J. Speleol.* 37, 1– 10 Robinson, Arthur H., Morrison, Joel L., Muehrcke, Phillip L., (1995), *Elements of Cartography*, 6th ed. John Wiley & Sons, Canada Setiawan, P. (2011) Sangkulirang nan eksotis: pusaka alam dan pusaka budaya kawasan karst, Kutai Timur Warter, V., et al., Late Miocene seasonal to subdecadal climate variability in the Indo-West Pacific (East Kalimantan, Indonesia) preserved in giant clams. *Palaios*, 2015. 30(1): p. 66-82.

## Abiotic, biotic and cultural resources on the aspiring UNESCO Global Geopark Valleys of Cantabria

*Jaime BONACHEA<sup>1\*</sup>, Javier HERNÁNDEZ<sup>2</sup>,*

*Universidad de Cantabria<sup>1</sup> Spain , Mancomunidad de Municipios Sostenibles (MMS)<sup>2</sup> Spain*

Valleys of Cantabria aspiring Geopark covers approximately 600 km<sup>2</sup> in the north of Spain; it is characterized by steep slopes, with heights ranging from 0 to 1600 m.a.s.l. The territory includes 19 municipalities (some of them with serious problems of depopulation) with a population of 60,604 inhabitants. The main economic activity in the territory is the tertiary sector (mainly tourism), which is predominant in the coastal and urban areas; live-stock farming plays a major role in rural environments, and fishing, linked to the canning industry. The Geopark candidate includes sites of high geological interest developed on Mesozoic materials affected by tectonic processes, which have been modelled by different agents that have acted in the area throughout the Quaternary, giving rise to glacial, karstic, fluvial and coastal morphologies. The different elements presented are excellent examples of the evolution suffered by the relief, allowing the different evolutionary stages of coastal areas (Atlantic Ocean) to be linked to the rivers Asón and Miera. In this sense, the main interest to visit the aspiring Geopark is the excellent representation and diversity of geomorphological environments, processes and geomorphological forms that can be observed from the head of the valleys to the coastline. The high ecological value of the existing natural heritage in the proposed Geopark is highlighted by the presence of some of the most biologically diverse places in Spain: a Ramsar zone, a Natural Park, five Special Areas of Conservation, Natura 2000 European Ecological Network, a Special Protection Area for Birds and three areas catalogued as Important Bird Areas and Biodiversity. The applicant Geopark has an important cultural heritage; the Covalanas cave, declared a World Heritage Site in 2008, three cultural itineraries of the Council of Europe are present in the territory, and a large number of prehistoric sites, megalithic constructions, religious, architectural and industrial buildings which are important examples of the culture in this area. In the future Geopark exist local producers on agriculture or organic farming, livestock or fishing. Thus, there is a high quality of agricultural and fishing products and the agro-food industries which fix the population in the rural environment, while at the same time preserving local traditions and villages. Also, the active tourism companies offer geotourism interpreted activities in contact with nature and the geology of the surroundings: trekking, climbing, canoeing, caving, bird watching, via ferrata or cycling activities. The roads and paths that run through the territory are suitable for all audiences. The declaration of this area as a Global Geopark is a great opportunity to disseminate geology and geomorphology, as well as other activities linked to human activities, in addition to becoming a geology and nature classroom for the educational schools and colleges distributed in the territory.

**Keywords:** Aspiring Geopark Valleys of Cantabria-Spain, Geological heritage, Natural heritage, Cultural heritage, Geotourism activities

**Corresponding author:** jaime.bonachea@unican.es

**Reference:**

Bonachea et al., (2019). Proposal for a declaration of a geopark in the Valleys of Soba, Asón and Miera (Cantabria, Spain). Regional Conference on Geomorphology, International Association of Geomorphologists. 19-21 Septiembre 2019, Atenas, Grecia. Bonachea et al., (2021). Geological heritage in the Valleys of Cantabria Geopark project. X International Online ProGEO Symposium, Spain, 7-10th June, 2021.

## Exploring the Jeonbuk West Coast Geopark

*LEE Seungyeon<sup>1\*</sup>,*

*JEONBUK WEST COAST NATIONAL GEOPARK<sup>1</sup> Republic of Korea*

Jeonbuk West Coast Geopark located in Buan and Gochang Counties in the western region of the Republic of Korea features a variety of interesting sites and activities. We would like to introduce everything about our Geopark to you. Jeonbuk West Coast Geopark has 32 geosites (UNESCO application) which have plain and hill areas consisting of Jurassic granite and the Cretaceous volcanic rock. The Cheaseokgang and Jeokbyeokgang Cliffs, which are designated national parks and the Ungok Wetland and Dolmen site, which is designated as a UNESCO Heritage Site are the best geosites that people love in this area. You can also feel the collaboration with culture, ecology and geology in the Geosites. Our Geopark has always tried to get local people involved in the Geopark for sustainable local development. In this way, the locals in Buan and Gochang have developed Geofood (Geosite character cookies, volcanic mulberry jam) and Geoproducts (Geovillage pottery) which is made of local products (mulberry, mulberry leaves, etc.) for their economy. They have also managed Geopark experience programs which include sharing short of geo-stories with you. We have special interpreters who go to Geoschool, learn about why and how to conserve Geopark, and what to do in the Geopark. They introduce the Geosite where they live near to their friends, family, and visitors. When you visit Jeonbuk West Coast Geopark and then feel like walking along the geotrail, we recommend getting a guide from local resident interpreters whenever you can. Jeonbuk West Coast Geopark allows local people to learn about and understand the concept of Geopark and get involved in Geopark activities. We will continue to conserve our geo heritage and also look for a way to practice sustainable use.

**Keywords:** Jeonbuk West Coast Geopark, Buan, Gochang, Geoproducts(volcanic mulberry jam, geovillage pottery), local people

**Corresponding author:** sylee89@korea.kr

**Reference:**

## The Caçapava Aspiring Geopark in southernmost Brazil: advances in local development

*André BORBA<sup>1\*</sup>, Felipe GUADAGNIN<sup>2</sup>, Patrícia FERREIRA<sup>3</sup>, Stener OLIVEIRA<sup>4</sup>,  
Caçapava Aspiring Geopark, UFSM<sup>1</sup> Brazil, Caçapava Aspiring Geopark team, Unipampa<sup>2</sup> Brazil,  
Caçapava Aspiring Geopark team, UFSM<sup>3</sup> Brazil, SECULTUR Caçapava<sup>4</sup> Brazil*

The Caçapava Aspiring Geopark is a 3,047 km<sup>2</sup> territory in a low-development area of southernmost Brazil. The strategy focuses on more than 20 geosites, looking for their conservation, legal protection (where possible and desirable), widespread use for educational purposes, and sustainable geotourism in those with scenic, aesthetic attributes. Three geosites have a significant international value, all of which recording the 'Camaquã basin' context (sedimentary and volcanic Ediacaran and Early Paleozoic successions), and sharing scientific, scenic, ecological, cultural, educational, and functional values: (1) the Guaritas geosite, where ruin-shaped hills of a dissected plateau expose Early Palaeozoic red beds of the fluvial successions of the Guaritas Group; (2) the Serra do Segredo geosite, a cuesta where outstanding round-shaped hills expose mainly conglomerates of the Ediacaran Santa Bárbara Group, a unique point for rock climbing; and (3) the Minas do Camaquã geosite, where sulphide-ore impregnated Ediacaran lacustrine sandstones and conglomerates crop out in cap-shaped hills, a picturesque abandoned mining village completing the scenario. Some important advances have been recently achieved: (a) craftswomen have received qualification workshops on geology, palaeontology, art and design, and started to produce beautiful geo- and biodiversity-related handicraft; (b) rural communities are being oriented to produce healthy, sustainable fruit jams with local and traditional agricultural products; (c) small businesses are being established especially for hostelling and guidance in geotourism, offering geo-tours and geo-trails, as well as sheep farming and wool-dyeing experiences; (d) attention is being paid to the needs of traditional, vulnerable communities, such as 'quilombolas' and 'guarani' indigenous people; and (e) there are already many projects aiming at the recovery of abandoned urban and rural historical edifices for building interpretive/visitor facilities. The involved universities (UFSM and Unipampa), the Mayor's Office and the deputy/secretary of culture and tourism (SECULTUR), along with the civil society currently strengthen their integration and commitment to making formal agreements to achieve the UNESCO Global Geopark label.

**Keywords:** Caçapava territory, Geopark strategy, ruin-shaped hills, mining heritage

**Corresponding author:** andre.w.borba@ufsm.br

**Reference:**

## The Quarta Colônia Aspiring Geopark: the dawn of modern ecosystems

*Jaciele SELL<sup>1</sup>, Adriano FIGUEIRÓ<sup>2</sup>, Michele VESTENA<sup>3</sup>, Flávio PRETTO<sup>4\*</sup>, Flavi LISBOA FILHO<sup>2</sup>,  
Universidade Federal de Santa Maria<sup>1</sup> Brazil, UFSM<sup>2</sup> Brazil, CONDESUS<sup>3</sup> Brazil, CAPPA-UFSM<sup>4</sup> Brazil, UFSM<sup>2</sup> Brazil*

The Quarta Colônia Aspiring Geopark (QCAG), with an area of 2,923 km<sup>2</sup>, is a territory that demarcates the transition between the volcanic Brazilian Meridional Plateau (> 500 m.a.s.l.) and the sedimentary lowlands of the Peripheral Depression. It represents also the limit between two major Brazilian biomes: the Atlantic Forest and the Pampa, with enormous biodiversity encompassing forest and grassland ecosystems. The territory is formed by the administrative boundaries of nine municipalities (Silveira Martins, Ivorá, São João do Polêsine, Agudo, Dona Francisca, Restinga Seca, Nova Palma, Faxinal do Soturno and Pinhal Grande), which, all together, have a population of 62,193 inhabitants. Triassic sedimentary successions yield the QCAG greatest geoh heritage treasure: a rich fossil fauna and flora recognized internationally, and which has been scientifically documented for decades of research. This fossil record helps document a crucial moment in the history of life on Earth, for Triassic ecosystems represent life's takeover after the massive Permo-Triassic extinction at the end of the Paleozoic. In that sense, the Triassic witnessed the rise of modern lineages, which began shaping modern ecosystems. For instance, the QCAG area yields a rich fossil record of cynodonts, a group of vertebrates that include the forerunners of mammals; early lepidosauromorphs, which include forerunners of modern lizards and rhynchocephalians; and the oldest records of unequivocal dinosaurs yet discovered, which document the rise of the most iconic fossil group in palaeontology that dominated the planet through most of the Mesozoic, finally giving rise to modern birds. Fossils like Bagualosaurus, Buriolestes, Gnathovorax, Brasilodon, Riograndia, Hyperodapedon, Ixalerpeton, Prestosuchus and Exaeretodon are just a small sample of a great taxonomic fossil diversity that still today is unearthed from red beds at the QCAG, and which is consistently being updated with new discoveries.

**Keywords:** Quarta Colônia, Aspiring Geopark, Triassic, Fossil heritage

**Corresponding author:** jaciele.sell@ufsm.br

**Reference:**

## The Busan Geopark: An Aspiring UNESCO Global Geopark

HA Sujin<sup>1\*</sup>, KANG Garyeong<sup>2</sup>, CHAE Yong-un<sup>1</sup>, JOO Young Ji<sup>3</sup>, LIM Hyounsu<sup>1</sup>,

*Department of Geological Sciences, Pusan National University<sup>1</sup> Republic of Korea, Ecological-Geology Team, Environmental Policy Division, Busan Metropolitan City<sup>2</sup> Republic of Korea, Department of Geological Sciences, Pusan National University<sup>1</sup> Republic of Korea, Department of Earth and Environmental Sciences, Pukyong National University<sup>3</sup> Republic of Korea, Department of Geological Sciences, Pusan National University<sup>1</sup> Republic of Korea*

The Busan Aspiring Geopark is located on the southeastern coast of the Korean Peninsula. The size of the aUGGp is 805.2 km<sup>2</sup> with a population of approximately 3.4 million. The region is the perfect example of a harmonic landscape with rivers (e.g. Nakdonggang River), sea and beaches (e.g. Dadaepo Beach, Taejongdae, and Haeundae Beach), and mountains (e.g. Geumjeongsan Mountain and Jangsan Mountain). There are beautiful offshore bars near the estuary, a coastline featuring superb beaches and scenic cliffs, mountains with excellent hiking trails and extraordinary viewpoints, and hot springs scattered throughout the city. Geologically, the aUGGp area is composed of (1) dacitic and andesitic volcanic rocks of the Yucheon Group intercalated with (2) tuffaceous sedimentary rocks of the Dadaepo and Taejongdae formations, (3) rhyolitic rocks of the Yucheon Group, (4) Bulguksa Granitic Rocks intruding into older rocks, and (5) Quaternary alluvium, in ascending order. The aUGGp shows the complex history of tectonic evolution, crustal deformation, basin development, and volcanic activity, as well as depositional pattern from the Cretaceous to the Holocene in East Asia. The area provides vast information on the paleoclimate, paleoenvironment, and paleoecology during the period. The Busan Aspiring Geopark is operating a geo-trail combined with history, cultural heritage, education, tourism, and experience facilities, visitors can relax and refresh in nature. The most important thing is that all geosites on this geo-trail are easy to access by public transportation. People can easily walk down the road to hike the trails and to immerse in the wonders of nature and geological heritage since the geological trails are connected to the city's paved roads. Furthermore, to popularize the Geopark, experience programs (e.g. 'Time Travel with a geoguide', 'Geosite Environment Improvement', 'Outreaching Geopark: geoschool') and activity books were designed to connect the geosites in the Geopark and school curriculum and the Geopark is being used as a place for popularization practice. In addition, education and tourism programs related to marine science, climate change, and natural disasters were developed in cooperation with the Busan National Science Museum, Busan Safety & Experience Center, and the Climate Change Center, which are experience facilities within the Geopark area. The Geopark provides an outstanding example of an urban Geopark where the role of the Geopark information facilities as a site of education and tourism is strengthened by deploying geoguide with great expertise. Ultimately, the Busan Geopark hopes to contribute to the vitalization of the local economy and sustainable life of mankind together with the International Geological Congress (IGC), which is scheduled to be held in Busan in 2024.

**Keywords:** Busan, Aspiring Geopark, Urban Geopark

**Corresponding author:** sjha@pusan.ac.kr

**Reference:**

Cho, H., Son, M., Cheon, Y., Sohn, Y. K., Kim, J. S., Kang, H. C., 2016. Evolution of the Late Cretaceous Dadaepo Basin, SE Korea, in response to oblique subduction of the proto-Pacific (Izanagi/Kula) or Pacific plate. *Gondwana Research*, 39, 145-164. Kang, K., Cho, H., Kim, H. J., Kim, S., Son, M., Kim, J. S., Paik, I. S., 2014. The value of the Busan National Geopark's geosites and geheritages: a case study focused on geotrail. *Journal of the Geological Society of Korea*, 50(1), 21-41. Kim, C. M., Han, R., Kim, J. S., Sohn, Y. K., Jeong, J. O., Jeong, G. Y., Lee, K., Kim, J. C., 2019. Fault zone processes during caldera collapse: Jangsan Caldera, Korea. *Journal of Structural Geology*, 124, 197-210. Williams, J. R., Dellapenna, T. M., Lee, G. H., 2013. Shifts in depositional environments as a natural response to anthropogenic alterations: Nakdong Estuary, South Korea. *Marine Geology*, 343, 47-61.

## Geopalcos: Art, Science and Nature as instruments of cohesion and promotion of the aspiring Geopark Algarvensis territory

*João Serrão MARTINS<sup>1</sup>, Andreia PINTASSILGO<sup>1</sup>, Ana MORIES<sup>2</sup>, Ana ARAÚJO<sup>3</sup>, Cristina VEIGA-PIRES<sup>4\*</sup>,  
Câmara Municipal de Loulé<sup>1</sup> Portugal, Câmara Municipal de Loulé<sup>1</sup> Portugal, Câmara Municipal de Silves<sup>2</sup> Portugal,  
Câmara Municipal de Albufeira<sup>3</sup> Portugal, University of Algarve<sup>4</sup> Portugal*

The aspiring UNESCO World Geopark Algarvensis Loulé-Silves-Albufeira is an area in the south of Portugal (total area of 1,381 km<sup>2</sup>), in the center of the Algarve region, on which, part of the counties of Loulé, Silves and Albufeira, are included. The geodiversity of the aspiring Geopark Algarvensis Loulé-Silves-Albufeira tells the story of 350 million years of Earth's history and more than 20 thousand years of the history of human occupation. With clear and defined limits, it has a geological heritage of major importance, at national and international levels, and allies a geoconservation strategy and a set of environmental education and awareness policies, to the promotion of sustainable socio-economic development based on geotourism activities, involving local communities, contributing to the valorization and promotion of local products and producers. With the aim of enriching and stimulating the territory of the aspiring Geopark Algarvensis-Loulé-Silves-Albufeira to become an UNESCO World Geopark, the multidisciplinary intervention programme Geopalcos Art.Science.Nature happened between May and September 2021. Geopalcos Art.Science.Nature has been designed as a biannual event that connects art, science and nature with and for the people at the territory of the aspiring Geopark. This event was born from the collaboration and participation of local populations and from a challenge to artists and scientists to think the territory as a place of creation, reflection, disquiet and dazzle. The intention was to lead a nature lover to discover art and science, an art fan to stroll through nature and the paths of knowledge, or even a curious person to relate their knowledge to natural beauty. The activities that materialized Geopalcos in its first edition were 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. Although occurring during the pandemic, the success of the event is reflected by more than 3125 participants in 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 from the Algarvensis Aspiring Geopark territory.

**Keywords:** Art, Science, Nature, Communities, Portugal

**Corresponding author:** joao.serrao@cm-loule.pt

**Reference:**

Algarvensis Aspiring Geopark. 2021. Geopalcos Loulé-Silves-Albufeira Best of 2021: <https://www.youtube.com/watch?v=yF5HrOGeYmw>

## Plateau History, Geological Wonder

Fan ZHANG<sup>1\*</sup>,

Linxia Geopark Service Center<sup>1</sup> China

### I. A brief introduction to Linxia Geopark

Linxia Geopark is located in Linxia Hui Autonomous Prefecture, Gansu Province, China, with a total area of about 2,120 square kilometers. Cretaceous dinosaur footprints and late Cenozoic paleofauna as prominent representatives, Late Cenozoic strata, northern Danxia landform and the landscape of the Three Gorges of the Yellow River are important supplements integrated culture, geology, ecology and culture of local ethnic minorities.

#### (1) Geological or geomorphic type of the area

There are 13 geological or geomorphic types in the area. Paleontological fossils (Liujiaxia dinosaur footprint fossil locality, Hezheng Paleozoological fossil locality), stratigraphic profile, geological structure relics, granite landform, loess landform, Danxia landform, canyon landform, fluvial landscape, lakes, wetlands, springs, waterfalls and landslides. The most prominent highlight of geological relics is the rich paleontological fossil relics and their occurrence strata.

#### (2) Abundant geological relics resource in the park

Linxia Geopark is rich in geological relic resources. The main geological relic resources include paleontological relic and geomorphic landscape relic.

#### (3) Diversity both in biology and ecology in the park

Linxia Geopark is rich in biology and ecology, with 1,021 species of wild vascular plants distributed. There are 1,140 species of wild animals.

#### (4) Precious cultural heritages in the park

1 world cultural heritage site, 4 national key cultural relics protection units, 12 provincial cultural relics protection units and 31 county and municipal cultural relics protection units.

### II. Main geological relics of the park and their international value and comparative significance

#### (1) Ichnofauna of Liujiaxia dinosaur footprints fossil group

10 fossil sites have been found, of which 4 have been artificially exposed, about 2800 square meters. There are 1831 footprints in 150 groups of 11 categories. Its international value and comparative significance, First, the Liujiaxia dinosaur footprints were carefully exposed manually, so they are completely preserved and clear, with a strong sense of three dimension.

#### (2) Hezheng Paleozoological fossil Ichnofauna

more than 130,000 fossil specimens have been found and collected in more than 100 fossil sites in Linxia Basin. It is the area with the most abundant mammalian fossils in China and even the whole Eurasian continent.

First, it is the most abundant platybelodon fossil in the world.

The second is the largest Hipparion fauna in the world.

The third is the largest hyena in the world -- giant hyena.

Fourth, the unique Hezhenggia in the world. Hezhenggia is one of the most representative animals in the Hipparion fauna in Hezheng area.

Fifth, the earliest quaternary woolly rhinoceros in the world.

Sixth, the world's largest Equus -- Equus Eisenmannae. The horse is the largest Equus in the world.

---

**Keywords:** Linxia Geopark, Cretaceous dinosaur footprints, late Cenozoic paleofauna, Late Cenozoic strata, Danxia landform

**Corresponding author:** 20449452@qq.com

**Reference:**

Posters of Linxia Geopark

---

## GIS As Tool For Geosite Awareness

*Sónia OLIVEIRA<sup>1\*</sup>, Delminda MOURA<sup>1</sup>, Luis PEREIRA<sup>2</sup>, Cristina VEIGA-PIRES<sup>1</sup>,*

*Centre for Marine and Environmental Research<sup>1</sup> Portugal, Centre for Marine and Environmental Research<sup>1</sup> Portugal,  
Albufeira Council<sup>2</sup> Portugal, Centre for Marine and Environmental Research<sup>1</sup> Portugal*

In the last decade there has been a focus on the dissemination of international, national, and municipal data making them available for consultation or for download and future processing by the population in GIS programs. This data is made available through Geoportals, which are portals to Internet-based geospatial resources, allowing users to discover, view and access geospatial information and services provided by a wide range of organisations. From this data there are unlimited options for analysis by users, including students and teachers, such as making maps, 3D models and other applications. One of the examples of practical applications is the development of storymaps, based on web applications that allow to tell a story in a dynamic way combining geographical maps with text and other multimedia contents. These applications are increasingly used in scientific dissemination, as well as educational tool within a wide range of themes. They have thus also great potential to enable the awareness about the geoparks and the geosites values to all the public in an interactive and appealing way. Accordingly, we developed, in the context of the Algarvensis aspiring Geopark, a Story Map regarding the walking path - PR4 Escarpão Plateau, in which the history of this geomorphological entity is told, and suggestions are made on how to explore it in several locations along the 8 km route. This digital educational resource can be used to explore the geosite during the walking route, but also as a virtual field trip in a classroom context.

**Keywords:** Aspiring Geopark Algarvensis, Escarpão Plateau, Storymap, GIS

**Corresponding author:** saoliveira@ualg.pt

**Reference:**

Story map link: <https://storymaps.arcgis.com/stories/b711579310b84aaf9e7383f6965f70f0>

## Promoting Geosites In The Community - The Escarpão Plateau (South of Portugal)

*Sónia OLIVEIRA<sup>1\*</sup>, Delminda MOURA<sup>1</sup>, Luis PEREIRA<sup>2</sup>, Cristina VEIGA-PIRES<sup>1</sup>,  
Centre for Marine and Environmental Research<sup>1</sup> Portugal, Centre for Marine and Environmental Research<sup>1</sup> Portugal,  
Albufeira Council<sup>2</sup> Portugal, Centre for Marine and Environmental Research<sup>1</sup> Portugal*

The Escarpão Plateau, offers the possibility to observe and study the most complete sedimentary sequence of the Upper Jurassic of the Eastern Algarve (161,2 to 145,5 million years). Five geological formations are exposed along the Escarpão Plateau, from the oldest at the bottom of the valley of the Quarteira rivulet, to the most recent at the top: Peral Formation, Jordana Formation, Cerro da Cabeça Formation, Escarpão Formation and Limestone Formation with *Anchispirocyclina lusitanica* (foraminifera). Together, they bear witness to the carbonate ramp deposition of tepid waters of the Tethys domain, when present day Europe was still a mere set of islands. Throughout the Quaternary Period, the karst processes shaped a landscape of sparse and poor soils in which successive generations knew how to adapt their subsistence agriculture and way of life. How should this type of geosite be promoted? The Algarvensis aspiring geopark opted to create several walking paths, among them, the 8 km path across the Escarpão Plateau passing through 11 points of interest, including biosites and geosites (with interpretative boards) and having a view to the surrounding cultural and historical heritage. This path will also be accompanied by an audioguide, so that the walker can embrace the sounds and the history of this geosite along the way. Furthermore, the geosite was promoted by the Portuguese Geologists Association by fieldwork and the formation of 70 national secondary teachers and by the Science Centre of Algarve as a reference for Summer Science activities about paleoecology, using corals and other fossils as proxies. The communication with the community has also been increased to get their opinions and their collaboration in the application for UNESCO Global Geopark.

**Keywords:** Aspiring Geopark Algarvensis, Escarpão Plateau, Jurassic, Geosite

**Corresponding author:** saoliveira@ualg.pt

**Reference:**

Internet page of the Aspiring Geopark Algarvensis: <https://geoparquealgarvensis.pt/>

## The Triassic Vertebrates Of The Aspiring Geopark Algarvensis

Hugo CAMPOS<sup>1\*</sup>,  
*Museu Municipal de Loulé<sup>1</sup> Portugal*

The paleontological research conducted during the last decade at the territory of Geopark Algarvensis, in Southern Portugal, has revealed the occurrence of rich fossil vertebrate bearing layers, in the Triassic of the Grés de Silves Formation. One of the most notable discoveries is the bonebed composed of numerous remains of temnospondyl amphibian *Metoposaurus algarvensis*, a species known exclusively from the Geopark Algarvensis territory. The remaining recovered fauna includes the mandible of the first record of phytosaurs in the Iberian Peninsula and remains of the first placodonts reported in Portugal. While *M. algarvensis* and phytosaur remains were uncovered solely in one fossiliferous bed in the Penina site (Loulé municipality), the placodont remains are quite abundant occurring at multiple stratigraphic levels and localities spread throughout the Geopark territory. Based on the cranial and osteoderm material, a henodontid placodont has been identified. Due to the rarity of the fossil record of Henodontidae, known only from two other sites worldwide, the Algarve record is of exceptional scientific importance. The mentioned findings were instrumental in propelling the conception of the Geopark Algarvensis project, for their national and international relevance. The Triassic vertebrates have not only been a subject of scientific studies but also became a central topic of museological exhibitions, educational activities, merchandise and pieces of art, fostering a sense of identity within the local communities and serving as ambassadors of paleontology and geology in the aspiring Geopark Algarvensis.

**Keywords:** Algarve, Geopark, Triassic, *Metoposaurus*, Placodonts

**Corresponding author:** hugomcfields@gmail.com

**Reference:**

Brusatte, S. L., Butler, R. J., Mateus, O., & Steyer, J. S. (2015). A new species of *Metoposaurus* from the Late Triassic of Portugal and comments on the systematics and biogeography of metoposaurid temnospondyls. *Journal of Vertebrate Paleontology*, 35(3), e912988.

## Adapting the geological maps to allow a better experience in the Hiking paths in aspiring Geopark Algarvensis Loulé-Silves-Albufeira

*Bruno RODRIGUES<sup>1</sup>, Cristina VEIGA-PIRES<sup>2\*</sup>, Paula TEIXEIRA<sup>3</sup>, Sónia OLIVEIRA<sup>4</sup>,*

*n.a.<sup>1</sup> Portugal, University of Algarve, CIMA<sup>2</sup> Portugal, Câmara Municipal de Silves<sup>3</sup> Portugal, CIMA<sup>4</sup> Portugal*

The aspiring Geopark Algarvensis Loulé-Silves-Albufeira to UNESCO World Geopark has a geological heritage of great importance at the national and international levels. In the area that encompasses the municipality of Silves, there are 6 walking routes in a total length of 80km. These were not planned to promote the geology however they allow the visitors to make a journey in the geological and landscape interpretation from the geologic record. The geological cartography available at a scale of 1:100,000 makes a detailed interpretation difficult. In this sense, a geological survey was carried out at a scale of 1:15,000 along each of the pedestrian paths. This geological survey and adaptation were made based on the existing one. This "update" of the geologic map allows the creation of a list of sites or places of geological interest. In the most important sites, a mark on the field with a QR code will be installed. Based on all the elements surveyed along the hiking paths a story map is being created allowing a virtual tour of the geopark territory.

**Keywords:** Hiking trails, aspiring geopark, story map, Algarve

**Corresponding author:** bmgrodrigues@gmail.com

**Reference:**

## Best Practice of Sister Geopark Cooperation Between Ciletuh Palabuhanratu UGGp and Izu Peninsula UGGp

*Dody SOMANTRI<sup>1</sup>, Adjie ACHMAD RIDWAN<sup>1</sup>, Mega FATIMAH ROSANA<sup>2\*</sup>,  
Ciletuh-Palabuhanratu UGGp<sup>1</sup> Indonesia, Ciletuh-Palabuhanratu UGGp<sup>1</sup> Indonesia,  
Faculty of Geological Engineering, Universitas Padjadjaran<sup>2</sup> Indonesia*

As a fellow geopark that was designated as UNESCO Global Geoparks in April 2018, Ciletuh Palabuhanratu UGGp has a sense of togetherness and closeness to Izu Peninsula UGGp. CPUGGp is located in West Java Province, Indonesia, and Izu Peninsula UGGp is located in Shizuoka Province, Japan. These two provinces have collaborated as Sister Provinces since 2017 in the fields of human resource development, economy, socio-culture, education, technology, and tourism. To increase development in the tourism sector, especially through the potential for developing geoparks, a cooperation agreement was signed between UGGp owned by the two provinces in November 2019. Various program activities have been designed and implemented between the two geoparks, including: 1. Exchange of display material about geoparks in each geopark information center; 2. Exchange of visits and training for geopark managers; 3. Co-organization of socialization and training activities for the community.

In the future, this collaboration will continue to be improved, including in terms of exchanging educational materials, holding joint exhibitions or seminars, as well as conducting joint research on various aspects of similarities between the two geoparks.

**Keywords:** Ciletuh Palabuhanratu UGGp, Izu Peninsula UGGp, Sister Geopark, Collaboration

**Corresponding author:** timkeukeuhciletuh@gmail.com

**Reference:**

MoU between Ciletuh-Palabuhanratu UGGp with Izu Peninsula UGGp

## A Nordic Collaboration

*Kamilla PEDERSEN<sup>1\*</sup>, Mikko KIUTTU<sup>2</sup>, Berglind SIGMUNDSDOTTIR<sup>3</sup>,*

*Trollfjell UNESCO Global Geopark<sup>1</sup> Norway, Rokua UNESCO Global Geopark<sup>2</sup> Finland, Katla UNESCO Global Geopark<sup>3</sup> Iceland*

The Nordplus-funded school project is a collaboration between Rokua UNESCO Global Geopark (RUGGP) in Finland, Trollfjell UNESCO Global Geopark (TUGGP) in Norway, Katla UNESCO Global Geopark (KUGGP) and Vatnajökull National Park (VNP) in Iceland as well as three upper secondary schools from the three UGGP's. The project consists of six one-week exchanges between the schools and the territories and working in the schools between the exchanges. The main goal of the project is to strengthen students' knowledge and awareness on geoheritage, culture and sustainable communities in rural areas in the three countries.

The project studies the development of nature, landscape and human cultures in the framework of six of the United Nations' sustainable development goals (SDG's):

- Goal 6 (Water and sanitation for all)
- Goal 7 (Sustainable and modern energy)
- Goal 8 (Decent work and economic growth)
- Goal 12 (Consumption and production pattern)
- Goal 13 (Climate Change and actions to compact climate change and its impacts)
- Goal 14 (Use of the oceans, seas and marine resources)

The four territories with their unique geoheritage offer comprehensive and concrete learning environments to study the SDG's. Simultaneously, the students learn better the uniqueness of their home regions which enhances their positive attitudes towards home and the Nordic environment. The four parks and their representatives strengthen project's expertise and support the schools to achieve learning and pedagogical aims.

The project connects schools which are actively using Geoparks in their teaching and share the same values as the Geoparks. RUGGP and KUGGP have already applied a Geopark school concept, being awarded, for example, to Vaala upper secondary school which is the coordinator of the Nordplus project. During this project, an international network of Geopark-oriented schools will be created to support sharing of common materials, methods and experiences on Geopark-themed teaching. The network, hopefully, also supports international cooperation between schools and Geoparks in future.

Contents in the poster: Information about the project, Examples from the students work, Resume of the exchanges so far, Further plans for the project, Photos from the project

**Keywords:** Sustainability, Geopark, collaboration, geoeducation, Nordic

**Corresponding author:** kamilla.pedersen@trollfjellfriluftsråd.no

**Reference:**

<https://www.katlageopark.com>, <http://trollfjellgeopark.no/index.php/no>, <https://www.rokuageopark.fi/en/><https://geoheritage.fas.is/>

## Geotourism and Geoeducation In The Shilin UNESCO Global Geopark

*Jihong BAO<sup>1\*</sup>,*

*Shilin Global Geopark Administrative Bureau<sup>1</sup> China*

The Shilin UNESCO Global Geopark, covering an area of 350 km<sup>2</sup>, is located in southwest China's Yunnan province. It features numerous odd-shaped rock formations, and in 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. Geotourism specially focuses on geology and landscape, promotes tourism to geosites and an understanding of earth sciences through visiting, learning from, appreciating and engaging in geosites. Training workshops are frequently conducted to upgrade the capacity building of tour guides, because they play a significant role in geotourism, and by whom geoscience is widely spread among visitors; 12 geotrails are well developed for the purpose of geoactivities; local students are organized to visit the Geopark and geomuseum so that they will get vivid earth science; the interpretation panels inside the Geopark are annually improved to ensure they are nice and easily understood for common visitors; guide books, brochures, leaflets and geomaps are free for visitors to help plan their trips; scientific research is jointly carried out by the Geopark and other science institutions and universities, and the study results enhance geoheritage conservation.

**Keywords:** Shilin Geopark, Geotourism, Geoeducation

**Corresponding author:** bjh723@163.com

**Reference:**

Summery Report for UNESCO Network of Geoparks (Shilin) by Ministry of Land & Resources, the People's Republic of China (2003)

## Strengthening the Construction of Geo-cultural Village, Promoting Sustainable Development of Local Economy and Society

*Zhixing JING<sup>1\*</sup>,  
Fangshan UGGp<sup>1</sup> China*

Fangshan UNESCO Global Geopark of China, the first Global Geopark located in the capital city of a nation, has achieved great progress in terms of geo-heritage protection, geo-science research and popularization, and region sustainable development by geo-tourism. In recent years, on the basis of geoheritage protection and geoscience research and popularization, and with the requirements of the National instructions for the construction of geo-cultural villages, Fangshan UGGp has focused on strengthening the construction of geo-cultural villages and made a great achievements. Through the construction of geo-cultural villages, we have attracted schools at all levels and travel agencies to carry out geoscience popularization travel in cultural village, boosting the development of agriculture, planting and geo-tourism in cultural village, increasing the employment and income of local residents, and promoting the sustainable development of local economy and society.

**Keywords:** Geopark, Geoscience popularization, Geo-culture village, sustainable development

**Corresponding author:** happyjzhx@126.com

**Reference:**

Guidline of China Geological Survey on vigorously promoting the construction of geological culture villages (towns)

## Constructing "geoscience kingdom" and provide tourists with new suggestions on multi-dimensional tourism playing methods - Songshan UNESCO Global Geopark in action

Shaozong YUE<sup>1\*</sup>,  
Songshan UNESCO Global Geopark<sup>1</sup> China

Songshan is a famous geological mountain in the world and a famous historical and cultural mountain in China, there are geological relics and historical and cultural resources here, as early as the 1950s, China's older generation of geologists made pioneering work, After that, the research continued to deepen, at present, it has expanded to more than 130 universities, dozens of schools have taken Songshan as a teaching practice base, and more than 100 scientific research groups have participated in the research on various resources in Songshan area. According to big data statistics. There are 6776 scientific research and popular science articles with the theme of Songshan and Dengfeng, where Songshan is located, A total of 638 people have completed their dissertations on Songshan or Dengfeng, Where Songshan is located, Among them, there are 121 doctoral theses and 517 master theses; There are more than 40 types of funds participating in Songshan scientific research; More than 40 Monographs on Songshan's Geosciences and culture have been published, thus establishing Songshan as a well deserved "geoscience kingdom" in the world. A large number of scientific research results show that Songshan is a treasure house of geological relics resources and an "Encyclopedia of geoscience" that can never be learned. In a more open form, the managers of Songshan Mountain are attracting scholars and groups at home and abroad to participate in the in-depth research of Songshan Mountain, transforming scientific research achievements into tourism resources and providing tourists with new suggestions on multi-dimensional tourism playing methods.

**Keywords:** Songshan UNESCO Global Geopark, Geoscience Kingdom, Scientific research and popular science

**Corresponding author:** songshangeopark@163.com

**Reference:**

1. Fu Guanghong, Feng Jincheng. The Ancestor of Mountains - The Great Changes of Songshan[M]Beijing:Geological Publishing House, 2009. 2. Zhao Taiping, Zhang Zhonghui, Zhou Yanyan, Wang Shiyan etc. Precambrian geology of the songshan area, Henan Province, China.[M]Beijing:Geological Publishing House, 2012

## The New Geo-science Experience Center of Shennongjia UNESCO Global Geopark

Jinxin CHEN<sup>1\*</sup>,

*Administration of Shennongjia National Park<sup>1</sup> China*

The exhibition mode of the old geomuseum of Shennongjia UNESCO Global Geopark is monotonous and lacks of interaction. In order to improve this shortcoming, in addition to upgrading the display of the geomuseum, Shennongjia UGGp started to build a geo-science experience center in 2020, which has been open to the public since October 1, 2021. Using VR, AR and other interactive display technologies, the new Geo-science Experience Center allows visitors to learn about the origin of the universe, the process of the formation and development of the earth and the environment it is in, the spheres of the earth, the characteristic rocks, fossils and minerals of Shennongjia, the geological evolution of Shennongjia, the geological and geomorphological features of Shennongjia and other information related to Shennongjia, in a fun and interactive way, so as to popularize earth history and geoscience knowledge to the public, especially primary and secondary school students. Since the opening of the Geo-science Experience Center, it has attracted a large number of visitors, and its fresh, interactive, immersive and experience-based approach to science popularization has been well received by visitors, especially children, and has greatly improved the geo-science popularization capability of Shennongjia UGGp. This poster introduces the functions and features of the exhibition units of the Geo-science Experience Center with illustrations.

**Keywords:** geo-science popularization, interactive technologies, experience, fun, Shennongjia

**Corresponding author:** snjdzgy@163.com

**Reference:**

1. Design of the Popular Science Education Information System of Shennongjia National Park
2. News report by Shennongjia Converged Media Center on Oct. 3, 2021

## The Curriculum Design For The Sanqingshan Geopark Museum

Wenjing ZHAO<sup>1\*</sup>, Kejian XU<sup>2</sup>, Siyuan CHEN<sup>1</sup>,

Management Committee of Sanqingshan Geopark<sup>1</sup> China, China University of Geosciences(Beijing)<sup>2</sup> China,

Management Committee of Sanqingshan Geopark<sup>1</sup> China

Educational tourism is an innovation in the integration of on-campus and off-campus education, which to a certain extent makes up for the singularity of on-campus education. In recent years, China has attached great importance to the function of youth museum education, and has issued related policies to encourage high school and primary school students to use museum resources, so as to comprehensively improve students' education. Geopark museums showcase typical geology and landforms, natural ecology and local culture. They have rich scientific, ornamental and educational value and are an important place for educational tourism. The Sanqingshan Geopark Museum is the first batch of educational tourism bases for geosciences in China. It has been carrying out educational activities since it was first put into use in 2018, and has made great progress. In accordance with the characteristics of the Geopark and the requirements of educational tourism, this paper discusses the curriculum design of the Sanqingshan Geopark Museum with respect to the five aspects of the 5E philosophy, i.e., curriculum objectives, curriculum resources, learning contents and methods, curriculum implementation, and curriculum evaluation.

**Keywords:** Geopark, Museum, Educational tourism

**Corresponding author:** sqsdzgy@163.com

**Reference:**

Progress Report of Sanqingshan UNESCO Global Geopark Introduction of Sanqingshan Geopark Museum The Study of Research-based Course Design with Guidance, Practice, and Evaluation as Cores

## Imbabura UNESCO Geopark as an Engine of Public Geo-Education

*Lisbeth OÑA<sup>1</sup>, Patricia RENGEL<sup>2\*</sup>,*

*Yachay Tech University<sup>1</sup> Republic of Ecuador, Kyung Hee University<sup>2</sup> Republic of Korea*

Geopark Imbabura project establishes geo-education as a fundamental basis for expanding knowledge and generating opportunities within local communities. At the same time, Imbabura Geopark seeks to boost the value of the cultural identity of Imbabura inhabitants based on the recognition, respect, and use of the geological heritage and nature. For these reasons, engagement activities with the public has been intensely developed. The results have been more than satisfactory and the public has shown support to these activities. Moreover, the academy played an important role in terms of geo education. So far, 8 training courses have captured the attention of more than 200 people, who have received classes on the environment, geology, geological history of Imbabura, and tourism. The training courses have included dynamic laboratory practices and field trips to the different geosites of the region to instill in the population a friendly behavior with the geological heritage and strengthen existing tourist routes. In 2021, professors and students build simple seismographs from low-cost materials to directly impact the community and make it a teaching resource for schools in Imbabura province. In March 2020, to multiply efforts, strengthen the provincial identity, and promote the transfer of knowledge, the first online congress "Te Vivo Imbabura" was held. Students of Yachay University showed the state of art knowledge related to the 12 geosites of Geopark Imbabura. On the other hand, the articulation of civil and social organizations such as "Taita Imbabura Consortium" and the permanent campaigns of "Friends of Imbabura Geopark" have been in charge of transmitting the objectives and projects of the GPI to indigenous communities through educational workshops with a purely local and non-scientific approach to empower the population in topics of environmental conservation and use of natural resources to apply them to geotourism. These workshops have generated spaces for reflection towards active participation in local communities' development. They reach about 60 people per community, most of them women. In addition, activities such as the first drawing contest on myths and legends of Imbabura were held during the first year of the pandemic. In summary, geopark Imbabura join the interest and necessities of several groups and created spaces for public education. The activities undertaken by both academia and civil and social organizations have created spaces to identify problems and opportunities to improve the quality of life of Imbabura inhabitants from geo-education.

**Keywords:** Geo-education, Imbabura Geopark, Academy, Conservation, Community

**Corresponding author:** lisbeth.ona@yachaytech.edu.ec

**Reference:**

-Lorena, S., Guerrón, A., Mabel, D., Mera, A., Agustín, E., Albuja, C., Ernesto, C., & Leiton, M. (2018). UNESCO's Global Geoparks and its importance on communities'. 6(1), 93–108.-Moreno, P. J., & Leiton, C. M. Imbabura Geoparque Mundial de la UNESCO: un enfoque integral para el desarrollo del territorio. Turismo y desarrollo desde un enfoque territorial y el covid-19, 123.

## 3D Modelling Of Geosites - From Surveying To Outreach

*Gabriel Alejandro GOYANES DÍAZ<sup>1\*</sup>, Gonçalo VIEIRA<sup>2</sup>, Carmen SONCCO<sup>2</sup>, Emanuel DE CASTRO<sup>3</sup>, CERENA / IST - Universidade de Lisboa<sup>1</sup> Portugal, CEG/IGOT, Universidade de Lisboa<sup>2</sup> Portugal, CEG/IGOT, Universidade de Lisboa<sup>2</sup> Peru, Estrela UNESCO Global Geopark<sup>3</sup> Portugal*

The UNESCO Estrela Geopark is located at Serra da Estrela, Portugal. It has an area of 2,216 km<sup>2</sup> and its landscape is very diversified as a result of multiple geological transformations, climatic contrasts, as well as a very ancient human occupation (IV millennium b.C.). The genesis of the mountain range is related with a pop-up process during the Miocene, with the uplands and several valleys having been reworked by glacial processes during the Pleistocene. The Estrela Geopark shows over 120 geosites of different typologies, several of them of difficult access to visitors with reduced mobility. With this in mind and supported by Unmanned Aerial Vehicle technologies, several geosites are being surveyed using optical cameras, allowing to create 2D and 3D digital models used for management, dissemination and education purposes. Surveys were conducted with quadcopters at different heights, following grid survey lines and with camera tilts from nadir to 60°, depending on terrain roughness. Then the structure from motion-based techniques in Pix4D Mapper were used to build the point cloud, the Digital Surface Model (DSM) and the orthomosaics. The orthomosaics and DSM are being used for the detailed mapping of the geosites and for monitoring the impact of visitors. Terrain models of several geosites have been printed in 3D and are used for education and dissemination activities. They have been integrated in several public exhibitions and may be used as by people with visual impairment or loss vision, for improving the understanding of the geopark features and their genesis.

**Keywords:** Geosites, Surveying, Geodiversity, 3D modelling, Portugal

**Corresponding author:** gabriel.goyanes@tecnico.ulisboa.pt

**Reference:**

## Geo-Urban Routes As A Powerful And Easily Available Educational Resource - Case Of Angra Do Heroísmo City In Azores UGGp

*Manuel Paulino COSTA<sup>1</sup>, Salomé MENESES<sup>2\*</sup>, João Carlos NUNES<sup>3</sup>,  
Azores UNESCO Global Geopark<sup>1</sup> Portugal, Regional Secretariat for Environment and Climate Change<sup>2\*</sup> Portugal,  
Azores University, Geosciences Department<sup>3</sup> Portugal*

One of the major concerns of UNESCO Global Geoparks (UGGp) is to demonstrate to local communities the importance of their territory in a holistic approach, based on the natural phenomena and human interaction that created the landscape and on the different elements that compose it. There are several strategies used by UGGp's in order to explore the educational (and touristic) potential of their territories, from geosite routes to workshops on geodiversity and geological heritage. In line with this concern, (geo)urban routes are an excellent resource that allows an integrative approach to the different aspects of the heritage and identity of a certain place – natural and cultural (tangible and intangible). In fact, the (Geo)Urban Route proposed by the Azores UGGp for the city of Angra do Heroísmo (Terceira island), has proved to be a powerful educational tool for the most varied audiences (locals and visitors, students and teachers), and with interest in different areas. This route allows to explore a city immersed in history and classified as UNESCO World Heritage Site, while exploring the geomorphological context in which the city was installed (angra=bay), interpret the geological phenomena (earthquakes, floods and tsunamis) that affected it and also identify and learn about the natural resources used on its built heritage. The buildings in the city of Angra do Heroísmo (with interesting exceptions) reflect the geology of the city and surrounding area, marked by the presence of tuffs from the Monte Brasil surtseyan cone and the trachytes from the Guilherme Moniz polygenetic volcano. Urban GeoRoutes are considered to be a powerful educational resource, easily accessible, low-cost, suitable for different audiences (including visitors) and easily adapted/replicated in other urban centers, including in rural areas.

**Keywords:** Urban Route, Educational Resource, Cultural Heritage, Geodiversity

**Corresponding author:** salome.c.meneses@azores.gov.pt

**Reference:**

Meneses, S.et al (2021) Geo-Urban Routes as a powerful and easily available educational resource -Case of Angra do Heroísmo city in Azores UNESCO Global Geopark

## Shilin UGGp: A Perfect Example Of Geoconservation And Management

*Jihong BAO<sup>1\*</sup>,*

*Shilin Global Geopark Administrative Bureau<sup>1</sup> China*

Shilin UNESCO Global Geopark, covering an area of 350 square kilometers, 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; Mater 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 revenue is allocated as research fund and carry 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.

**Keywords:** Shilin, Geopark, Geoconservation

**Corresponding author:** bjh723@163.com

**Reference:**

Summary Report for UNESCO Network of Geoparks (Shilin) by the Ministry of Land & Resources of the People's Republic of China (2003)

## Geoconservation in the Estrela UNESCO Global Geopark

*Fábio LOUREIRO<sup>1\*</sup>, Emanuel CASTRO<sup>1</sup>,  
Estrela Geopark<sup>1</sup> Portugal, Estrela Geopark<sup>1</sup> Portugal*

Geoconservation is one of the key areas of a UNESCO Global Geopark. From the preservation and valorisation of geological heritage it is possible to promote the sustainable development of these territories, which represent important strategies for the 21st century. In the Estrela UNESCO Global Geopark, Geoconservation is based on a holistic approach which allows, in a clear and transversal way, to promote the preservation, interpretation and valorisation of the unique geological heritage of this territory, focusing on two areas of action: a) Interpretation and Valorisation and b) Monitoring, Conservation and Protection. With regard to the Interpretation and Valorisation of geological heritage, the actions have been directed towards broadening its interpretation, as well as raising awareness for its preservation and protection. Examples of initiatives are the continuous implementation of interpretative structures, the work with the populations in the inventory of new geosites and the dissemination and awareness-raising among schools and the rest of the community. For the Monitoring, Conservation and Protection of geological heritage, efforts have been promoted in partnership with local agents, with the monitorization and improvement of accessibilities to geosites. Its protection has also been worked with these stakeholders, through the classification of sites in the Municipal Master Plans, thus ensuring a protection status for geosites. Finally, the research in partnership with several Universities has allowed the monitorization of geological heritage with new and innovative technologies. In the light of the above, and one year after the classification of this territory by UNESCO, there have been various challenges but also opportunities for Geoconservation in the territory, and it can be clearly seen that the various initiatives undertaken in the territory have contributed to put the geological heritage back at the centre of priorities.

**Keywords:** Geopark, Geoconservation, Preservations, Valorization

**Corresponding author:** [fabiouloureiro@geoparkestrela.pt](mailto:fabiouloureiro@geoparkestrela.pt)

**Reference:**

Loureiro F., Castro E., (2021), Geoconservation in the Estrela UNESCO Global Geopark

## Provisional indicators for abiotic nature The development of abiotic services assessment methodology in two UNESCO Global Geoparks

Sara GENTILINI<sup>1\*</sup>, Pål THJØMØE<sup>1</sup>,  
Magma Geopark<sup>1</sup> Norway, Magma Geopark<sup>1</sup> Norway

The International Geoscience and Geoparks Programme approved in 2015 by the 38th session of the UNESCO General Conference, introduced the UNESCO Global Geoparks (UGGp) as the new UNESCO site designation for areas with geological heritage of international values. A bottom-up holistic approach is applied within areas of rich geodiversity and geoheritage, which aim to support local communities in promoting awareness on climate change issues, natural resources and geo-hazards phenomena. Enhancement of geoheritage and strategies for geoconservation have a key role for the recognition of a territory as UNESCO Global Geopark and for keeping the status, which, differently with respect to other UNESCO designations, are re-assessed every 4 years from UNESCO. (Henriques and Brilha, 2017). Although abiotic nature (geodiversity) plays a crucial role in the human development, by offering services defined as “geosystem services” (Gray et al., 2013) the related geological heritage is still barely considered within recent ecosystem classification systems (MA 2005; Haines-Young and Potchin, 2013). Our study focused on two selected UGGp “pilot areas”: the Sesia Val Grande UNESCO Global Geopark (Italy) and the Magma UNESCO Global Geopark (Norway), by applying to four geosites a trans-disciplinary approach within the H2020 MSC “Tech4culture” project. Qualitative and quantitative indicators for the selected geosites are analysed considering the “services” they provide to the society within the “ecosystem service approach”. Both geodiversity assessment and indicators analyses are developed taking into account the UGG mandate, values, goals and management’s needs as well as the relevant geodiversity variables (Zwoliński et al., 2018) and the related geosystem services: regulating, supporting, provisioning, cultural and knowledge (n.1 to n.25; Gray et Al., 2013). The following methodological steps, have been applied to each single geosite:

- 1) Geological processes influencing the services. After general analysis based on the definitions by Gray M (2019), we scaled down to local description of the services.
- 2) Abiotic factors influencing the process: detecting each single variable playing a role into the evolution of the overall process: to each “specific abiotic factor” we linked tailored questions supporting the development of peculiar provisional indicators and the related scores.
- 3) Geosystem service scaling and assessment, the research team defined a scale to assess single factors, which range from 10 (minimum) to 100 (maximum) and intermediate scores. Preliminary testing of the methodology within geosites of the pilot areas offered valuable suggestions for geodiversity protection and geoheritage enhancement of both the Geoparks. By further application to other geosites within areas of diverse geological contents, we aiming at implementing the methodology and enhancing the scientific debate on effective abiotic nature assessment.

**Keywords:** Geopark, Geoconservation, Preservations, Valorization

**Corresponding author:** [fabioloureiro@geoparkestrela.pt](mailto:fabioloureiro@geoparkestrela.pt)

**Reference:** Loureiro F., Castro E. (2021) , Geoconservation in the Estrela UNESCO Global Geopark

## A Study of Characteristics and Geological Significance of Geoheritage Resources in Arxan UNESCO Global Geopark, Inner Mongolia, China

Lulin WANG<sup>1\*</sup>,

China University of Geosciences, Beijing<sup>1</sup> China

Arxan UNESCO Global Geopark is a comprehensive geopark mainly represented by volcanic landforms and hot spring landscapes. In this paper, based on the geological survey and evaluation of the geoheritage, the authors divided the geoheritage resources into 2 categories, 7 types, 9 subtypes and 47 kinds. Additionally, the authors analyzed the characteristics of various geoheritage, compared and summarized previous studies, and discussed the important geotourism significance of the geoheritage of Arxan Geopark. Studies have shown that the geoheritage of Arxan Geopark have important scientific value in the fields of geomorphology, hydrogeology and geotourism, and provide a scientific reference for the sustainable development of the geoheritage of Arxan Geopark.

**Keywords:** geoheritage, geological significance, UNESCO Global Geopark, Arxan

**Corresponding author:** lindakitten@qq.com

**Reference:**

- [1] CHEN Lihong, ZHANG Pu, WU Fadong, GAO Guoming. 2015. Geoheritage Landscapes and Tourism Earth Sciences Significance of the Danxia Lanform National Geopark in Chengde, Hebei Province[J]. *Acta Geoscientica Sinica*, 36(04):500-506(in Chinese with English abstract). [2] CHU Hao, WU Fadong, HAN Jinfang. 2017. Characteristics and Quantitative Evaluation of Geoheritage Resources in Yimengshan Geopark[J]. *Scientific and Technological Management of Land and Resources*, 34(04):100-106(in Chinese with English abstract). [3] Geoenvironment Department. 2016. Ministry of Land and Resources. Chinese Geoparks Building Guide[M]. Beijing: Geological Publishing House: 1-120 (in Chinese). [4] MA Yuxuan, LI Jianghai, CHEN Yaohua.2019. Geomorphological Characteristics of the Quaternary Volcanoes and Their Tectonic Implications in Aershan Region, Central Greater Khingan Range[J]. *Acta Scientiarum Naturalium Universitatis Pekinensis*, 55(02):289-298(in Chinese with English abstract). [5] SUN Hongyan, TIAN Mingzhong, WU Fadong.2007. Characteristics and Origin of Granite Mortars in the Hexigten World Geopark[J].*Geological Review*, 4:486-490(in Chinese with English abstract). [6] SUN Wenyan, ZHANG Zhiguang, WANG Min, ZHEN Yuan. 2015. The role of geoparks in the generalization and education of geosciences[J]. *Geological Review*, 61(S1):856-857(in Chinese with English abstract).

## Population of Wreathed Hornbills in the Ciletuh - Palabuanratu UNESCO Global Geopark

*Resit SOZER<sup>1\*</sup>, Adjie ACHMAD RIDWAN<sup>1</sup>,*

*Ciletuh-Palabuhanratu UGGp<sup>1</sup> Indonesia, Ciletuh-Palabuhanratu UGGp<sup>1</sup> Indonesia*

The Wreathed Hornbill (*Rhyticeros undulatus*) is a species of bird from the hornbill family (Bucerotidae). Its distribution is very wide, starting from South Butan, East India, Southwest China, Southeast Asia and Peninsular Malaysia. In Indonesia, the Wreathed Hornbill is spread over Kalimantan, Sumatra, Java and Bali (including several offshore islands). Despite its wide distribution, the Wreathed Hornbill is included in the IUCN Red List as "Vulnerable" and in Appendix II of CITES. In addition, the species is protected under the Indonesian Minister of Environment and Forestry Regulation No. P.106/MENLHK/SETJEN/KUM.1/12/2018, Law No.5 of 1990 and Government Regulation No.7 of 1999. The Wreathed Hornbills has become quite rare in Java. Due to the species' rarity, the Environment Agency (DLH) of Sukabumi Regency initiated a Wreathed Hornbill survey in the Ciletuh-Palabuhanratu UNESCO Global Geopark (CPUGGp). The CPUGGp is located in the western part of Sukabumi Regency, West Java Province. The determination of CPUGGp as a UNESCO Global Geopark in 2018 with a total area of 1,260 km<sup>2</sup> (126,000 hectares). Its geographical location is at S06°46'07"; E106°31'34", and the altitude varies from sea level (0 m asl) along the west and south coasts, to 2,960 m asl. on the slopes of Mount Halimun-Salak in the north. The implementation of this survey involved the Cikananga Wildlife Center (YCKT), the local NGO PAPSI, the BBKSDA of West Java, and the local community wardens of the Cikepuh conservation area. The survey lasted from February to March 2021. The main objectives of this survey were to: 1) Verify the continued survival of the Wreathed Hornbill in the GGUCp area; 2) Collect knowledge about the spatial distribution of the species in the GGUCp area; 3) To collect knowledge about suitable habitats for the species; 4) To collect knowledge about population size, or number of individuals; 5) To increase knowledge about Sex-ratio (balance between the number of males and females); and 6 ) To identify locations for future (long-term) reintroduction or restocking programs. The rediscovery of this rare Wreathed Hornbill population is very good news for conservation and a potential tourist attraction in the CPUGGp. On the other hand, it is necessary to immediately raise awareness and safeguard the Wreathed Hornbill habitats within the CPUGGp. In an effort to restore the Wreathed Hornbill population in CPUGGp, it is also necessary to release new individuals to genetically enrich this wild Wreathed Hornbill population.

**Keywords:** Ciletuh Palabuhanratu UGGp, Wreathed Hornbill, *Rhyticeros undulatus*, Biodiversity

**Corresponding author:** patanjalaoutdoor@gmail.com

**Reference:**

Indonesian Minister of Environment and Forestry Regulation No. P.106/MENLHK/SETJEN/KUM.1/12/2018 Law No.5 of 1990

## The Vikos-Aoos Geopark in Greece: Recent Advances in Geoscientific Research

Christos L. STERGIOU<sup>1\*</sup>, Alexandros CHATZIPETROS<sup>1</sup>, Panagiotis PASCHOS<sup>2</sup>, Evangelos NIKOLAOU<sup>2</sup>, Haritakis PAPAIOANNOU<sup>3</sup>,  
School of Geology, Aristotle University of Thessaloniki, 54124, Thessaloniki, Greece<sup>1</sup> Greece, School of Geology, Aristotle University  
of Thessaloniki, 54124, Thessaloniki, Greece<sup>1</sup> Greece, Hellenic Survey of Geology and Mineral Exploration, Region of Epirus, Eleonas,  
48100, Preveza, Greece<sup>2</sup> Greece, Hellenic Survey of Geology and Mineral Exploration, Region of Epirus, Eleonas, 48100, Preveza, Greece<sup>2</sup>  
Greece, Vikos-Aoos UGGP – Development Agency of Epirus S.A. (EPIRUS S.A.), Region of Epirus, 45332, Ioannina, Greece<sup>3</sup> Greece

The Vikos-Aoos Geopark is located at the northwestern part of the Pindus Mountain Range at the Region of Epirus, northwest Greece. Since 2010, it is part of the European and Global Geopark Networks of UNESCO. The Geopark extends in an area of 1,200 km<sup>2</sup> near the Greek-Albanian border also covering a large area of the Northern Pindus National Park. The area is characterized by a mountainous and rugged terrain, which is interrupted by steep gorges, elongated narrow valleys, and alluvial plains. Smolikas (Geros peak: 2,637 m asl) and Tymfi (Gamila peak: 2,497 m asl) Mountains host the highest peaks of the Geopark, while Vikos and Aoos Gorges, and Konitsa plain are ascribed to the lower relief morphology (Chatzipetros & Stergiou 2016). Besides the geological, geomorphological and natural aspects, distinct cultural aspects also characterize the Vikos-Aoos Geopark. Sixty-one traditional settlements, culturally and architecturally protected, are located within the Geopark and form the municipalities of Zagori and Konitsa. In this publication, we present a review of some of the recent advances in geoscientific research regarding the Vikos-Aoos Geopark. The Gamila peak spherical concretions were first described by Telbisz et al. (2019). They are found on the pathway (approximately at 2,100 m a.s.l.) to Gamila peak. They have spherical to elongated elliptical shapes (0.10 to 1 m in diameter) and concentric zones. Telbisz et al. (2019) suggest that their diagenesis was characterized by an early and imperfect carbonate cementation and by a simultaneous massive precipitation of SiO<sub>2</sub> in the intergranular space. The dissolution of siliceous bioclasts could be assumed as the major producer and supplier of SiO<sub>2</sub>-rich solutions resulting in silicification, however other external fluids enriched in SiO<sub>2</sub> could not be excluded (Telbisz et al. 2019). The Boila Rockshelter is located at the edge of the Voidomatis river valley. The site was in use for around 4000 years (14,000 to 9,500 BP, Elefanti et al. 2021). The geoarchaeological investigation documented that black chert from the Vigla limestone outcrops found in Vikos gorge was extensively implemented by the inhabitants of the rockshelter in tool making. Red and reddish-brown chert from central and coastal Epirus was also in use. The study held by Elefanti et al. (2021) suggests the deliberate selection of the most suitable local chert, changes in the scale of settlement and mobility, and a gradual emphasis on the manufacture and repair of hunting gear during the Late Upper Paleolithic and Early Mesolithic. The researchers state that "high mountain hubs such as the Tymfi and drainage systems like the Voidomatis and Aoos provide clues in the same way as coastal environments do; to the ways and rhythms through which human societies negotiated palaeoecological and other changes during the critical final phase of hunting and gathering before the advent of the Neolithic" (Elefanti et al. 2021).

**Keywords:** Vikos-Aoos Geopark, Tymfi, concretions, geoarchaeology, Epirus

**Corresponding author:** christer@geo.auth.gr

**Reference:**

Chatzipetros, A. Stergiou, C., 2016. Morphotectonic indications of uplift from the Vikos Gorge area using UAV: Preliminary results. Tectonics and Structural Geology Committee of the Geological Society of Greece, 1st TSG Meeting, Athens, Greece. Elefanti, P., Marshall, G., Stergiou, C.L., Kotjabopoulou E., 2021, Raw material procurement at Boila Rockshelter, Epirus, as an indicator of hunter-gatherer mobility in Greece during the Late Upper Palaeolithic and Early Mesolithic, Journal of Archaeological Science: Reports, v. 35, p. 102719. Telbisz, T., Stergiou, C.L., Mindszenty, A., Chatzipetros, A., 2019. Karst features and related social processes in the region of the Vikos gorge and Tymphi mountain (Northern Pindos National Park, Greece). Acta Carsologica 48(1), 29-42.

## The Mikuma Shrine, one of the geosite of the San'in Kaigan Geopark, was born from columnar joints of basalt

*Hajime NISHII<sup>1</sup>, Tsukasa TANAKA<sup>1\*</sup>, Yukino YOKOYAMA<sup>1</sup>, Sakurako KANOU<sup>1</sup>, Sana HONJO<sup>1</sup>,  
Tottori Keiai high school<sup>1</sup> Japan, Tottori Keiai high school<sup>1</sup> Japan, Tottori Keiai high school<sup>1</sup> Japan,  
Tottori Keiai high school<sup>1</sup> Japan, Tottori Keiai high school<sup>1</sup> Japan*

The basalt with horizon joint occurs in the precincts of Mikuma Shrine in the San'in Kaigan Geopark. This study is a summary of what the columnar joints of the Mikuma Shrine brought about to the people living in the area, based on literature surveys and interviews. The results of the investigation showed that the basalt with columnar joint was formed by the intrusion of magma about 5 million years ago. This horizontal columnar joint brought blessings to the local people as a stone material, and since it looks like a staircase extending to the heavens, it is also thought that the bridge legend (Japanese mythology) was born and became the object of worship and shrine. Legends also exist in the columnar joints of neighboring basalts, and it was possible to show how geological phenomena were connected to people's lives.

**Keywords:** San'in Kaigan Geopark, basalt, Japanese mythology

**Corresponding author:** nishii-h@t-ki.jp

**Reference:**

google maps WEB地理院地図吉岡温泉案内（大正三年六月十五日）吉岡温泉事務所発行裏日本（大正四年12月15日発行）久保邦武 著 気高群末垣村史（昭和4年）田中久秋 著 因幡誌上下（明治37年）安部惟親（恭庵）著 因伯業書因幡誌卷四、卷七（大正8年）安部惟親著

## Geodiversity & Geological Value of Yeoncheon Geosites on Hantangang Geopark: the Current Status and Future Research Direction

*KIM Daewoo<sup>1\*</sup>, YOON Misook<sup>1</sup>,  
Hantangang UGGP<sup>1</sup> Republic of Korea, Hantangang UGGP<sup>1</sup> Republic of Korea*

Hantangang River Geopark is located in the central part of the Korean Peninsula and in the border area between South Korea and North Korea. Due to the environments of the DMZ(De-Militarized Zone), military protected areas have been established in several places, which is a border area, so geological studies and investigations have been conducted in limited area. However, many geosites that were not reported in detail during the preparation process of the geopark were rediscovered.

Hantangang River Geopark is the only geopark in Korea with unique geology and topography developed around inland rivers. In particular, the Imjingang belt, which can be an indicator of the plate tectonic history in East Asia, has been developed around Yeoncheon. In addition, there is a dynamic and rare geoheritage where pillow lava formed in the river. As described above, the DMZ, the world's only divided area(nation), has brought lack of research and investigation project. However, it is currently attracting the attention of not only academia but also the general public as it has certified it as a Global Geopark by UNESCO. Currently, basic research has been conducted through the acquisition of drilling cores, and further research is being actively conducted in various topics. Research in six topics, including petrology, hydrogeology, and sedimentology, etc. is in progress while tracking the connection with the unique geology and topography of the Hantangang River Geopark, which will be briefly introduced here.

**Keywords:** Hantangang, Yeoncheon, Imjingang Belt, Pillow Lava, DMZ

**Corresponding author:** dwkim9202@korea.kr

**Reference:**

Korea Institute of Geoscience and Mineral Resources(KIGAM), Geological Survey Report (Yeoncheon), 2008, 1-83

## Producing Geopark Products with Local Businesses

*Susan MAY<sup>1\*</sup>,*

*Hakusan Tedorigawa Geopark Promotion Council<sup>1</sup> Japan*

Since 2017 the Hakusan Tedorigawa Geopark (here-in referred to as HTG), located in Japan, has been conducting a project called the "New Product Development Project", which involves providing funding to local businesses who pledge to produce a new product using the theme and/or logo of the HTG. The short-term goal of the project is to create new products that can be sold as HTG products, and to start forming connections with local businesses. The long-term goal of the project is to use the branding power of the HTG to empower local businesses to produce sustainable, long-selling products. Over the last four years, 11 businesses have developed over 13 new products for the HTG. This year we conducted a survey in order to discover the strengths and weaknesses of the project, and plan how to continue the project more effectively. We discovered that while most businesses were fairly satisfied with the project, they were unable to sell as much as they had planned, and only a small number of participants were continuing to actively promote and sell their products. Therefore, we believe that we need to put more effort into developing appealing products, as well as the promotion and availability of the products. Despite wanting to use this project to built new connections with local businesses, the majority of the applicants were already connected to, or in close communication with the HTG. Therefore, we believe that the project itself needs to be promoted through a wider variety of media to attract businesses not yet connected to the HTG. Overall the HTG branding alone did not seem to have an effect on the purchasing of the products, but as geoparks are still relatively new both nationally and globally, we believe that over time the awareness of geoparks, and the HTG will increase over time. Thus, the continuation and improvement of this project is vital in achieving our long-term goal of sustainable product development and sales.

**Keywords:** Geopark, sustainable development, tourism, regional development

**Corresponding author:** [geopark-cir@city.hakusan.lg.jp](mailto:geopark-cir@city.hakusan.lg.jp)

**Reference:**

## Sustainable Development of Community Economy - Leiqiong UNESCO Global Geopark as an example

*Chunyu LU<sup>1\*</sup>,  
Leiqiong UGGp<sup>1</sup> China*

Leisure Agriculture is considered as a growing global "sunrise industry". Developing leisure agriculture and rural tourism are effective measures to promote the healthy, rapid and sustainable development of local economy in geopark. The excellent geological environment and climatic conditions of Leiqiong UNESCO Global Geopark favour the cultivation of varied agricultural products, especially pineapples. Taking full advantage of this, Leiqiong further exploits the opportunity to develop its unique local resources and combines leisure agriculture with rural tourism, sale of agricultural produces and science popularization, such as creating "Pineapple Sea" AAA level tourist attraction, selling agricultural produces through live-streaming and holding pineapple culture festivals. This is able to provide long-term economic benefits to local community and at the same time promoting the concepts of UNESCO Global Geopark and sustainable development of local economy.

**Keywords:** leisure agriculture, rural tourism, science popularisation, sustainable development

**Corresponding author:** 3152981297@qq.com

**Reference:**

Overall plan of Pineapple Sea

## Local Communities as Engines to Shift the UNESCO Global Geoparks to the Heart of the 2030 Agenda for Sustainable Development

*Elizabeth SILVA<sup>1\*</sup>, Artur SÁ<sup>1</sup>,*

*Geosciences Center of Coimbra University, Portugal<sup>1</sup> Portugal, Geosciences Center of Coimbra University, Portugal<sup>1</sup> Portugal*

A research study recently done regarding the contributions of the UNESCO Global Geoparks (UGGps) for the 2030 Agenda for Sustainable Development involved the analysis of several sources that brought new light regarding this reality. Among them, especial focus was given to the interviews done to some elements and local inhabitants/stakeholders from the transnational Marble Arch Caves UGGp (Republic of Ireland & United Kingdom of Great Britain and Northern Ireland). These interviews allowed to compare the obtained data and brought a new light about what is written, for example, in the Progress Reports. It was interesting to understand what is effectively felt by the local inhabitants regarding the developed activities integrated in the management plan of this UGGp. It was also relevant their interpretation about the impacts of the developed activities in this territory. Furthermore, the interviews were done to obtain more detailed information about the awareness and degree of knowledge of the interviewees regarding the 2030 Agenda and its 17 Sustainable Development Goals (SDGs). By doing so, it was possible to have the perception of which SDGs were more relevant for the staff team and for the local inhabitants of this UGGp. In this sense, this research study highlighted the need of the UGGps management structures to assume their commitment to develop activities aligned with the targets and indicators of the SDGs. This commitment can be a way of promoting these territories, while educating and sensitizing local populations and visitors to the achievement of this global endeavor. However, this strategy should be defined in an articulated way considering the needs of the local inhabitants. In this context, the local communities can be more involved in the managing process, creating solid bonds between them and the managers of the UGGps and to accomplish the 'territorial bottom-up approach strategy', reinforced by the International Geoscience and Geoparks Programme recommendations. This demonstrates the importance of the local communities to do clear transformative steps to shift the world onto a sustainable and resilient path, as mentioned in the resolution approved by the United Nations (A/RES/70/1), that created the Agenda 2030.

**Keywords:** UNESCO Global Geoparks (UGGps), International Geoscience and Geoparks Programme (IGGP), SDGs, Local Communities, Engagement

**Corresponding author:** elizabethsilva.m@gmail.com

**Reference:**

SILVA, ELIZABETH MARIA ROCHA DA (2021). The contribution of the European UNESCO Global Geoparks for the 2030 Agenda for Sustainable Development – a study based on several data sources [Unpublished doctoral dissertation]. Universidade Nova de Lisboa. <http://hdl.handle.net/10362/114994> UNITED NATIONS (2015). Resolution adopted by the General Assembly on 25 September 2015. [https://www.un.org/ga/search/view\\_doc.asp?symbol=A/RES/70/1&Lang=E](https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E)

## The Role Of Costa Quebrada Aspiring Geopark In A Geoheritage - Rich Regional Context

*Gustavo GUTIERREZ<sup>1\*</sup>, Viola BRUSCHI<sup>2</sup>, Antonio CENDRERO<sup>2</sup>,*

*Costa Quebrada aUGGp<sup>1</sup> Spain, University of Cantabria<sup>2</sup> Spain, University of Cantabria<sup>2</sup> Spain*

Costa Quebrada aUGGp is located in the central coastal sector of Cantabria, a region of 5,321 km<sup>2</sup> extent in northern Spain. The region is made up of Paleozoic to Cenozoic sedimentary rocks. Paleozoic (Ordovician to Permian) rocks are confined to the westernmost part of the region, with some relevant additional outcrops of Carboniferous and Permian rocks related to the E-W bound Cabuérniga fault, in its central part. Triassic to Cretaceous materials are well represented and cover most of the region, especially the coastal lower-lying area and the inner valleys. Cenozoic materials outcrop in some coastal sectors. The Variscan Orogeny affected Paleozoic sequences, which were again affected, as well as Mesozoic-Cenozoic ones, by the Alpine Orogeny. As a result, the region is crossed by a mountain range parallel to the coastline, and crossed by river valleys which run into the Bay of Biscay. There are excellent examples of a wide variety of landforms, coastal, karst or glacial, among others. The variety of rock types and geological structures, as well as geodynamic processes and landforms, result in a rich geodiversity. Some sites, which illustrate different aspects of the regional geology, have been promoted as tourist attractions for over half a century. Examples of direct geological interest are the cable car to Fuente Dé (Picos de Europa) scarp and glacial valley, El Soplao cavern, or Fontibre, a karst outlet of the Híjar River, source of the Ebro, the largest river valley in the Iberian Peninsula. In others the geology represents a background, as in Cabárceno, where a spectacular paleokarst morphology provides the ideal frame for a nearly-natural zoo. The presence of different geo-resources, including a large number of karst cavities, favoured the settlement of human populations which created some of the most notable Cave Art manifestations in the world (including Altamira), which are listed under a UNESCO World Heritage label. Costa Quebrada aUGGp with its rich and expressive array of coastal landforms, contributes to this series of geoheritage attractions, most of them equipped for public visits and within a short distance between them. This will help to strengthen and enhance geotourism in the region, with offers for all kinds of public. Linking all those sites with other sites of geological interest in neighbouring regions, through a network connected to the Jacobean Way (the Transcantabrian Geodiversity Route), would boost geotourism in the whole northern fringe of Spain.

**Keywords:** Geodiversity, Geotourism, Cantabria, Northern Spain, Costa Quebrada

**Corresponding author:** [gustavo@costaquebrada.com](mailto:gustavo@costaquebrada.com)

**Reference:**

BARBA, F. J. & ADRADOS, L. (2004). *GeoCantabria: Itinerarios didácticos del XI Simposio sobre la Enseñanza de la Geología*. Gobierno de Cantabria. 192 pp. BRUSCHI, V.M. (2008). *Desarrollo de una metodología para la caracterización, evaluación y gestión de los recursos de la geodiversidad*. Tesis Doctoral en Red, Universidad de Cantabria, (España), pp. 654.

## Research on the Impact of Jiuhuashan Geopark Construction on the Upgrading of Tourism Economy

Qigang LIN<sup>1\*</sup>, Yao MENG<sup>2</sup>,

*Administrative Committee of Jiuhuashan Geopark<sup>1</sup> China, School of Environmental Studies,  
China University of Geosciences, Wuhan<sup>2</sup> China*

Geo-tourism is an essential component of tourism. Geopark is an important place to carry out geo-tourism 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 dominates tourist market in Jiuhuashan. 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. Then, geo-tourism 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 geological and ecological tourism) and Lianhua 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 Geopark can promote the development of Jiuhuashan tourism. In the future, with the construction of Jiuhuashan Global Geopark, 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 geo-tourism as the main part will contribute to the transformation and upgrading of Jiuhuashan as a composite tourist attraction.

**Keywords:** Geo-tourism, Geopark, Number of tourists, Jiuhuashan

**Corresponding author:** jhsgeopark@163.com

**Reference:**

- [1] Li Li. The Development Research of Science Tourism of Mulan Mountain National Geopark Based on the Visitors' Perception [D]. Hubei University, 2012. [2] He Zhefeng. Research on the Evaluation of Popular Science Tourism Resources for Geoparks: Based on Danxiashan Global Geopark [D]. China University of Geosciences (Beijing), 2018. [3] Zhang Changxiang. The Study of Jiu Hua Buddhism in the Qing Dynasty [D]. Anhui University, 2015.

## Construction of science popularization community in Taishan Global Geopark

*Ding HAIYANG<sup>1\*</sup>,*

*Taishan UNESCO Global Geopark<sup>1</sup> China*

In 2006, Taishan was approved as UNESCO Global Geopark, which has various types of geoheritage with high geoscience value. The protection and utilization of geoheritage is important for the construction and the development of global geopark. It has played a positive role in promoting local tourism and local economic development. Through cooperation with local enterprises and communities, the Global Geopark promotes employment and drives the development of related industries. In recent years, Taishan has continuously strengthened cooperation with local community residents, integrated geology with local culture and industry through the study of the relationship between geology and local culture. Taishan UGGp built a geological science popularization community, strengthening science popularization publicity and education, and ensuring the sustainable development of the protection and utilization of geoheritage.

**Keywords:** Taishan UNESCO Global Geopark, Geoheritage, Sustainable Development, Science Popularization

**Corresponding author:** 707845889@qq.com

**Reference:**

- [1] Gong Peng, Zhang Hongyan. Discussion on protection status and management suggestions of geoheritage in Shenzhen [J]. China mining, 2018 (27) 8:28-31 [2] LV Zhou. World heritage development in the context of social change [J]. Chinese cultural heritage, 2018 (1): 4-8[3] Jinxing, Ruan Liping, Zhao Shenzu. Thoughts on the protection and utilization of geoheritage in Shaoxing [J]. Land and resources, 2019.4:43-49

## New Technologies in the Service and Promotion of Geological, Natural and Cultural Heritage

*Georgia KITSAKI<sup>1\*</sup>, Haritakis PAPAIOANNOU<sup>1</sup>,  
Epirus S.A.<sup>1</sup> Greece, Epirus S.A.<sup>1</sup> Greece*

The aim of this presentation is to get the audience acquainted with the Vikos-Aoos UNESCO Global Geopark and its management and promotion with the use of innovative technologies either at the technological or the sociological level. The Vikos-Aoos UNESCO Global Geopark, which covers an area of 1,200 sq.km and is situated in the Region of Epirus in the borders with Albania, occupies the northwestern part of the Pindos mountain range and is characterized by a rough and impressive relief. In its territory includes mount 'Smolikas', the second highest mountain in Greece (2,637 m.), the impressive mount 'Tymfi' (2,497 m.) together with the famous gorges of Vikos and Aoos, traversed by their homonymous rivers. As regards anthropogeography, in its territory includes 62 settlements, with a population of approximately 8,000 inhabitants. The Vikos-Aoos Geopark stands out for its special cultural identity, which is reflected on the landscape via the wealth of the traditional settlements, the monuments of all historical periods and the remarkable architectural buildings of pre-industrial era. Thanks to its geographical position, the Management Body of the Vikos-Aoos Geopark seized the opportunity to use the Interreg Programme 'Greece-Albania 2014-2020' as a funding tool to promote its special characteristics and it created and implemented the project 'THEMA' (New technologies in the service of developing interregional thematic routes). Three thematic routes are promoted through the project 'THEMA': "History, Geology & Nature", "Culture and Gastronomy" and finally "Health & Wellness". The pioneering element of the project lies in the presentation of these cultural-thematic routes through a smart phone application, the 'THEMA app', which combines information to the visitor with the possibility of playing (gamification) through a mobilization and reward mechanism that involves local tourism entrepreneurs. Its aim is to attract new audiences and at the same time to offer quality and advanced services to everyone: tourists, travel agents and generally tourism professionals operating in the Geopark's area.

**Keywords:** application, technology, heritage, geology, cultural route

**Corresponding author:** gkitsaki@epirusa.gr

**Reference:**

Vikos-Aoos UNESCO Global Geopark

## Sustainable Development Of Hantangang River UNESCO Global Geopark Through Collaborations Of Geo-Education With Geo-Partners

*CHOI Jooah<sup>1</sup>,*

*Hantangang River UNESCO Global Geopark, Cheorwon area<sup>1</sup> Republic of Korea*

In the same way that the world's four major civilizations were formed along the river, the Hantangang River UNESCO Global Geopark has the characteristic of being along a river that meanders based on huge basalt plateau. As people gathered around the river to live, a society was formed, and various private businesses were created within that society. The businesses can be a restaurant, certain workshop or specialty products store. Some of them were able to remain the so-called 'geobrand'. Also, there are always have been children and teenagers in this society, so students go to nearby schools and learn many things. Hantangang River Geopark can combine them in a variety of ways and provide excellent field trips as outdoor classroom. For example, if students observe the process of making millstones with basalt rock, grind beans with millstone, and make geofoods with ground beans, students who have experienced this process will be able to feel that geoscience and daily life are closely related. Through this, geopark also play a role in connecting children and adults from person to person. As mentioned in UNESCO, by raising awareness with being more in touch with geoheritages in their area, local people can get an enormous sense of pride in their region. In conclusion, it is necessary to identify and compare the current status of domestic and overseas geoparks that have already preceded such collaborations, and to graft and implement them accordingly.

**Keywords:** Hantangang River, Geopark, Geo-Education, Geo-Partners, Sustainable Development

**Corresponding author:** jooahaon@korea.kr

**Reference:**

Farsani, Mortazavi, Bahrami, Kalantary, & Bizhaem, 2017 N.T. Farsani, M. Mortazavi, A. Bahrami, R. Kalantary, F.K. Bizhaem Traditional crafts: A tool for geo-education in geotourism Geoheritage, 9 (2017), pp. 577-584

## Ultra-High Resolution Maps And Models As Tools For Managing And Monitoring Environmentally Sensitive Geosites (Estrela Geopark, Portugal)

*Carmen Julia SONCCO<sup>1\*</sup>, Gonçalo VIEIRA<sup>1</sup>, Emmanuel DE CASTRO<sup>2</sup>, Gabriel GOYANES<sup>3</sup>,  
CEG - IGOT UNIVERSITY OF LISBON<sup>1</sup> Peru, CEG - IGOT UNIVERSITY OF LISBON<sup>1</sup> Portugal,  
Association Geopark Estrela<sup>2</sup> Portuga, CERENA/IST<sup>3</sup> Portugal*

The constitution of a geopark represents an innovation for the protection of the geological heritage of a territory, integrated into a scientific network with various strategies that promote knowledge of geosciences, conservation and boost sustainable economic development for its population. This economic development involves, in many scenarios, the promotion and development of diverse tourist activities, which without an adequate monitoring plan can generate impacts on natural areas. This research analyses the potential of ultra-high resolution mapping obtained using unmanned aerial vehicles (UAV) for supporting management plans for three geosites at the Estrela UNESCO Global Geopark: Lagoa Seca, Salgadeiras - Lagoas do Covão da Clarezza and Covão do Boi. At each site we used several surveys conducted between 2014 and 2019. Such maps allowed to identify the spatial dynamics of the geosites, quantifying change statistics and producing detailed maps for each geosite at the scale of 1:1400. Besides geological, hydrological and vegetation features, special relevance was given to trampling by visitors, both in rock outcrops, as well as on the sensitive grassland and scrub vegetation formations. In order to identify the areas of greatest impact from trampling, heat maps were produced, showing the density of such anthropogenic activity. The maps and models were used to develop differentiated management plans for each geosite, to be presented to the municipalities to support management practices. In this presentation, we provide an overview of the methods developed in the Estrela Geopark territory and the set of recommendations we have developed for geosite monitoring and management plans based on UAV mapping.

**Keywords:** Monitoring, Trampling, Geosite, UAV, Estrela Geopark

**Corresponding author:** carmenjuliaminanos@gmail.com

### Reference:

Borba, W. A., (2011). Geodiversidade e geopatrimônio como bases para estratégias de geoconservação: conceitos, abordagens, métodos de avaliação e aplicabilidade no contexto do Estado do Rio Grande do Sul. Instituto de Geociências – Universidade Federal do Rio Grande do Sul. Brilha, J. (2015). Inventory and Quantitative Assessment of Geosites and Geodiversity Sites: a Review. The European Association for Conservation of the Geological Heritage, Geoheritage, 119-134. Brilha, J.; Galopim, A.M. (2010). Geoconservation in Portugal: an Introduction. Associação Portuguesa de Geólogos. Ciências geológicas: Ensino, Investigação e sua História, Volume II, 436 pp. Brilha, J.; Pereira, P. (2020). Geoconservation in Portugal with Emphasis on the Geomorphological Heritage. in Vieira G., Zêzere, J.L. & Mora, C. (Eds.), Landforms and Landscapes of Portugal, Springer: 307-314. Gonçalves, J.A., & Henriques, R., (2015). UAV photogrammetry for topographic monitoring of coastal areas. ISPRS Journal of Photogrammetry and Remote Sensing 101 – 111. Henriques, MH.; Brilha, J. (2017). UNESCO Global Geoparks: a strategy towards global understanding and sustainability. IUGS – Vol.40, nº4, 349-355 Vieira, G.; Jansen, J.; Ferreira, N. (2005). Environmental Setting of the Parque Natural da Serra da Estrela, T. Pinto Correia, R.G.H. Bunce & D.C. Howard (eda.), Landscape ecology and management of Atlantic mountains, Landscape Ecology Series, IALE Publication series number 2, 53-64. Vieira, G.; de Castro, E.; Gomes, H.; Loureiro, F.; Fernandes, M.; Patrocínio, F.; Firmino, G.; Forte, J.P. (2020). The Estrela Geopark—From planation surfaces to glacial erosion. in Vieira G., Zêzere, J.L. & Mora, C. (Eds.), Landforms and Landscapes of Portugal, Springer: 341-357. Wimbledon, W. (2011). Geosites – A mechanism for protection, integrating national and international valuation of heritage sites. Dept. of Earth Sciences, University of Bristol, 14 pp.

## Developing the San'in Kaigan Geopark Trail and the Promotion of Geotourism during COVID-19 Pandemic

Yuki FUJIHARA<sup>1\*</sup>,

*San'in Kaigan UGGp Promotion Council<sup>1</sup> Japan*

The establishing a long trail route, 230 km long east-west route connecting Tottori City, Tottori Prefecture and Kyotango City, Kyoto Prefecture was completed in February 2020. Even during the time of sharp drop down of number of tourist and a severe decline of tourism industry because of COVID-19 pandemic, the trail walk activity was safely conducted in 2020 using the newly completed trail, under the title of "Now is the time to return to nature! To the San'in Kaigan Geopark Trail!", with regional campaigns to revitalize the local economy, maintain and secure employment and consumption, maintain the health of local residents, promote the use of national parks, and foster awareness of environmental protection. In implementing the activity, a system was established so that visitor centers, geoguides, outdoor activity businesses, retailers, and restaurants can cooperate to conserve geosites and provide services in order to strengthen geotourism after COVID-19 pandemic.

**Keywords:** San'in Kaigan UGGp, Tourism, Protection and conservation

**Corresponding author:** Yuuki\_Fujihara@pref.hyogo.lg.jp

**Reference:**

## Geosite Waluran, Hanjeli Tourism Village With The Concept Of Sustainable Food Security

*Dana BUDIMAN<sup>1\*</sup>,  
Ciletuh-Palabuhanratu UGGp<sup>1</sup> Indonesia*

Pioneer of the Hanjeli Tourism Village<sup>2</sup> Waluran is one of 8 sub-districts in Sukabumi Regency which is included in the CPUGG (Ciletuh Pelabuhan Ratu Unesco Global Geopark) area. Currently, Waluran village is increasingly recognized by showing its existence as a geosite that has the characteristic of being an alternative food center, namely Hanjeli commodity. Hanjeli (*Coix lacryma – Jobi L.*) is a type of tropical grain plant from the rice tribe or Poaceae originating from eastern Indonesia and Malaya which is spread to various parts of the world. At first, Hanjeli was not well-known and was not appreciated by the public because of its position as a local food ingredient which was marginalized by rice, corn and cassava. It was Asep who succeeded in re-popularizing this increasingly forgotten food crop, this 32-year-old man even managed to make Hanjeli the main attraction of the tourist village that he developed with the residents. For Asep, Hanjeli is an alternative food resource. Hanjeli can not only be processed like rice as a daily staple or as a mixture of rice, Hanjeli grains can also be developed into various types of snacks, can be fermented into tape, rengginang, and chips. While the flour is made into Hanjeli porridge and lunkhead or made into flour for fast food cereals such as Oatmeal. Because of its hard dry grains, Hanjeli has also long been known as a raw material for crafts such as beads, necklaces, bracelets, prayer beads and so on. The food security movement pioneered by Asep Hidayat or better known as Abah Asep has succeeded in changing his village to be more prosperous, the residents' economy is more independent, especially in food security, the land is greener, fields and yards are overgrown with Hanjeli plants and the narrow land around the house is overgrown vegetables. Currently the independent Waluran Village has been developed into a tourist destination known as the Hanjeli Tourism Village, in this tourist village, local, regional and foreign visitors can enjoy Hanjeli rice dishes and various processed food products made from Hanjeli such as tape, dodol. visitors can also learn about Hanjeli cultivation and how to process it, pick vegetables and eat processed fish, refresh the mind by enjoying the hamlet landscape which is included in the Geopark zone. Hanjeli Tourism Village is the only Tourist Village that emphasizes the concept of food security, not just an ordinary culinary tourism destination.

**Keywords:** Hanjeli, Tourist Village, Food Security, local food, Ciletuh Palabuhanratu UGG

**Corresponding author:** danabdmn@gmail.com

**Reference:**

Nurmala, Tati. (2011) Potential and Prospects of Development of Hanjeli (*Coix lacryma jobi L.*) as Nutritious Food Rich in Fat to Support Food Diversification Towards Independent Food Security. Rizal S, Indra G. T, Siska H, Ashrul T. Hanjeli Educational Village in Waluran Mandiri Village Sukabumi Regency.

## GEODIVERSITY AND GEOTOURISM POTENTIAL FOR SUSTAINABLE DEVELOPMENT IN BANDUNG BASIN

*Mohamad Sapari Dwi HADIAN<sup>1\*</sup>, Ayu Krishna YULIAWATI<sup>2</sup>, Ute Lies Siti KHADIDJAH<sup>1</sup>,  
Universitas Padjadjaran<sup>1</sup> Indonesia, Universitas Pendidikan Indonesia<sup>2</sup> Indonesia, Universitas Padjadjaran<sup>1</sup> Indonesia*

The research aims to identify and map geodiversity as an excellent potential for geotourism attraction, also classify them into geotourism destination. The research used mixed method with descriptive analysis, with data collection through desk study, field observation and analysis of geodiversity and geotourism potential. The main result identified 43 geo-diversity in the upper Citarum River with geoheritage and potential geotourism. The research classified these geosites into three geotourism destination, which are: primary geo-tourism destination, secondary and supporting tourism destination. The Citarum river is one of the main rivers in West Java, which has become a vital source of water and economic activities for West Java community, has geodiversity with a geoheritage potential that is scattered throughout the region. Environmental degradation has occurred in the area, protection of geoheritage is important for the geo-tourism. Citarum river area has the potential to be the main geotourism destination in Bandung Greater Area. Therefore, conservation of geoheritage requires good planning and policies.

**Keywords:** geodiversity, geoheritage, geotourism, Bandung, Sustainable development

**Corresponding author:** sapari@unpad.ac.id

**Reference:**

## Sustainable Development on Night Tourist Economy, Case of Qinling Zhongnanshan UNESCO Global Geopark

Yue Li<sup>1\*</sup>,

*Qinling Zhongnanshan UNESCO Global Geopark<sup>1</sup> China*

Being adjacent to Xi'an city which is a popular tourist destination in China, Qinling Zhongnanshan Geopark boasts many sites for sightseeing at night, especially those related to local cultures. As a result, the geopark is a mosaic area not only of abundant geological entities with special scientific importance, ecological and tourism resources during the day but also of attractive sightseeing in the night. By introduce the night tourism programmes in the geopark, this paper describes the present situation of the night tourism development and intends to start further discussion and study on this issue in order to promote the sustainable use of night tourist economy. The aim of development of night tourism will not only increase income of the geopark, but also promote global geopark and empower local social and economic sustainable development.

**Keywords:** Night Tourist Economy

**Corresponding author:** sammerlee@163.com

**Reference:**

Data of customer atisfaction survey by Qinling Zhongnanshan Global Geopark Management Office

## "LA VUELTA" IS COMING TO THE GEOPARK. WHAT A GREAT OPPORTUNITY TO PROMOTE IT!

*Javier LÓPEZ CABALLERO<sup>1\*</sup>, José M<sup>a</sup> BARRERRA MARTÍN<sup>1</sup>, Iván CORTIJO SÁNCHEZ<sup>1</sup>, Mario SUÁREZ ZABALA<sup>1</sup>,  
VILLUERCAS - IBORES - JARA GEOPARK<sup>1</sup> Spain, VILLUERCAS - IBORES - JARA GEOPARK<sup>1</sup> Spain,  
VILLUERCAS - IBORES - JARA GEOPARK<sup>1</sup> Spain, VILLUERCAS - IBORES - JARA GEOPARK<sup>1</sup> Spain*

In 2021 "La Vuelta", one of the most important stage cycling races on the world calendar, decided that one of its stage finishes would reach the top of Villuercas Peak. (1600 masl.) the highest point in the Geopark's heart. Television enables it to be followed by thousands of cycling lovers around Spain, but also Europe and Latin America. Among its stages, the arrivals at the top of a mountain are the ones that attract the most followers, constituting a television show due to the landscapes shown, the excitement of the race, and the accumulation of many visitors on the road edges. The media expressed admiration for the scenery and the harshness of the stage. It could not be otherwise since the last fifteen kilometers of ascent, a military track assigned for use in the geopark, had been adapted as a mountain road and geological itinerary of the geopark just the previous year. The geopark management staff observed the question between certain prevention due to the impact of public and mobile infrastructures and the opportunity for unprecedented tourism promotion. Consequently, informative and promotional actions were devised that took into account the geopark conservation principles and objectives. These actions include: - Intensive work of information and awareness on social networks; (#PicoVilluercas was trending topic this day!!) - Awareness campaigns with some local and regional cycling clubs; - Award for participants in awareness actions consisting of cycling jerseys with a special geopark design; - Information to the TV commentators to talk about the geopark during the broadcast and, finally, on-site monitoring on the day of the stage. - Our geopark mascot "Geopaca" was there taking photos with the people and it was a gift to the famous person who arrived this day. Among the results we can count the following: - Negative impacts on Pico Villuercas and the geopark facilities (panels and signage) were zero. - The public withdrew in order and took their own waste with no subsequent cleaning campaign was necessary. - The impact on tourism has been considerable, with a great increase in the number of visitors. In conclusion, a sportive event was a good experience and a great opportunity to promote the Geopark, with big success, to the rest of the world by TV.

**Keywords:** sustainable, tourism, cycling, promotion, sports

**Corresponding author:** javier@aprodevi.com

**Reference:**

Video about "La Vuelta" in Villuercas - Ibores - Jara UGGpLinks to Social Media

## Coastal cleaning in Reykjanes UNESCO Global Geopark, Iceland: Mapping of cleaned areas for monitoring and motivation

*Daniel EINARSSON<sup>1\*</sup>,*

*Reykjanes UNESCO Global Geopark<sup>1</sup> Iceland*

All over the world the ocean wave has brought an enormous amount of objects ashore, and which are scattered on our shores. These are marine debris like beverage containers, disposable packaging, plastics, fishnets and other mysterious objects which will be blown by the wind further inland. If nothing is done, the shores and our natural environment will be filled with debris from the sea. Marine debris filled shores is harmful to all marine life and clearing the coastline is important to ensure sustainability in the marine environment. Iceland is no exception. A high energy and rocky coastline surrounds Reykjanes Geopark for the most part and therefore difficult to navigate and clean, but that does not stop us from clearing the coastline. This year, a project was launched which set itself the lofty goal of cleaning the coastline and getting companies, schools, and institutions to take on coastal areas to clean up. Reykjanes Geopark and the Blue Army started a collaboration and set the goal of making the geopark coastline the cleanest in Iceland. The Blue Army is a local NGO, an environmental protection organization that focuses on the fight against plastic pollution in the sea through clean-up work, encouragement and raising awareness. The clean-up partnership is not only about cleaning beaches but also about documenting cleaning projects and keep records of areas and amounts of marine debris collected. That way, we can monitor the state of the coastline which will help us plan future clean-ups. Additionally, this will also help us build momentum within the local community and the government to take this matter seriously. Total length of the coastline that has been cleaned in 2021 is about 22 km. The total weight of the marine debris was about 15 metric tons. We aim to maintain this good and important co-operation project and make the coastline of Reykjanes Geopark the cleanest in the country. Cleaning up the rubbish from our shores only solves the problem in part because the ocean is still full of debris that will be washed ashore in the future with the associated environmental impact.

**Keywords:** Coastal Cleanup, Reykjanes, mapping, Environment, Marine debris

**Corresponding author:** [daniel@reykjanesgeopark.is](mailto:daniel@reykjanesgeopark.is)

**Reference:**

Einarsson, D. Knútsson, T. (2021). Aiming for the cleanest shoreline in Iceland. Reykjanes UNESCO Global Geopark.

## Danyang geopark, Korea

*KIM Hogeun<sup>1\*</sup>, AHN Jinsu<sup>1</sup>, LEE Jusuk<sup>1</sup>, KIM Yewon<sup>1</sup>, SON Munyeong<sup>1</sup>,  
Danyang geopark<sup>1</sup> Republic of Korea, Danyang geopark<sup>1</sup> Republic of Korea,  
Danyang geopark<sup>1</sup> Republic of Korea, Danyang geopark<sup>1</sup> Republic of Korea, Danyang geopark<sup>1</sup> Republic of Korea*

The Danyang area is located in the middle part of the Korean peninsula and is characterized by the sutured zone formed by the collision between the North Korean land and South Korean land. In 2017, Danyang county hosted over the 10 million visitors, After Covid 19, Number of visitors decreased, but tourism income increased. Danyang county is well known for its famous tourist attractions including the Eight Scenic Views of Danyang, cultural heritage, archeological heritage, ecological heritage and national park, etc. In addition, the Danyang area has many interesting geological heritage related to the collisions such as multi-layered thrust fault, overturned and/or vertical strata, superimposed old strata overlain by younger formations, epoch level unconformities and high ridgeline of metamorphic belts, etc. The Cambro-Ordovician limestones contain important fossils and show typical beautiful karst landscape including caves and dolines which add to the geodiversity of this area. The Danyang county applied for a Korea National Geopark in 2020. It is expected that Danyang county will make one of the world's popular tourist destinations (Geopark). As the Danyang area is also located in the riparian zone of the Namhangang (Danyanggang) River, where the total maximum daily loads are applied by national law, local residents are facing many behavior restrictions in their way of living and sometimes experience economic disadvantages. To compensate the economic losses of the local residents near the riparian zones, the Danyang geopark team is now planning to construct the area as geo-trails and geo-infrastructures aiming both conservation and sustainable development. And the River Commission accepted multi-million US dollars funding for the geopark project. We think that the concept of geopark is very persuasive and acceptable to the ordinary people, both either outside and inside the geopark territory. Therefore, we expect our geopark will be one of the successful models in Korea.

**Keywords:** Danyang, Geological heritage, Limestone, doline

**Corresponding author:** nojang007@korea.kr

**Reference:**

## The Calabarzon Geopark – Perspectives For The Second Geopark Of The Philippines And A Role-Model In Resilience

*Paula Naomi IRAPTA<sup>1\*</sup>, Viktor VEREB<sup>2</sup>, Alfredo Mahar Francisco LAGMAY<sup>1</sup>, Benjamin VAN WYK DE VRIES<sup>3</sup>,*

*University of the Philippines Diliman, National Institute of Geosciences, Diliman, Philippines<sup>1</sup> Philippines , Eötvös Loránd University, Department of Physical Geography, Budapest, Hungary<sup>2</sup> Hungary, University of the Philippines Diliman, National Institute of Geosciences, Diliman, Philippines<sup>1</sup> Philippines, Université Clermont Auvergne, Laboratoire Magmas et Volcans, Aubiere, France<sup>3</sup> France*

The Calabarzon Region of the Philippines, south of the bustling capital, Manila contains the Macolod Corridor, a northeast-southwest oriented volcano-tectonic field. Geoheritage with national to global significance occurs here, such as one of the Decade Volcanoes, the Taal Caldera which recently erupted (2020 January), the active Mt. Banahaw, or the popular Seven (Maar) Lakes of San Pablo and several other monogenetic volcanoes. It is an important research area due to its atypical tectonic setting, compared to the generally north-south trending subduction zones and arcs of the Philippines. Due to its proximity to Manila, it is an area frequented by tourists and also highly populated, meaning a high exposure to hazards. Here, we present the potential of establishing a geopark at the Macolod Corridor area, namely the Calabarzon Geopark that could function as the second geopark of the country after Bohol (Aspiring UNESCO Global Geopark). A preliminary list of geosites was selected with geomorphological- and geodiversity mapping and extensive fieldwork. We collected some examples of good practices, facilities and elements of key infrastructure that are already present in the area or could be implemented in the future, during the executive planning phase of the geopark. Finally, we put a special emphasis on the role of disaster risk reduction and improvement of resilience with geoheritage, as the area is heavily affected by geohazards (volcanism, earthquakes, typhoons) and geosites of past events could help in improving the resilience of locals and visitors as well.

**Keywords:** Calabarzon, geopark potential analysis, resilience, Philippines

**Corresponding author:** psirapta@up.edu.ph

**Reference:**

## Exhibition “Understanding Climate Change: Exploring The Consequences In The Geological Record. Cenozoic Ecosystems And The Current Threat”

*Athina PAVLIDOU<sup>1\*</sup>, Nikolas ZOUROS<sup>1</sup>, Ilias VALIAKOS<sup>1</sup>, Konstantina BENTANA<sup>1</sup>,*

*Natural History Museum of the Lesvos Petrified Forest/Lesvos Island UGGP<sup>1</sup> Greece, Natural History Museum of the Lesvos Petrified Forest/Lesvos Island UGGP<sup>1</sup> Greece, Natural History Museum of the Lesvos Petrified Forest/Lesvos Island UGGP<sup>1</sup> Greece, Natural History Museum of the Lesvos Petrified Forest/Lesvos Island UGGP<sup>1</sup> Greece*

Lesvos island UNESCO Global Geopark sets as one of its major priorities the fight against climate crisis and the activities for supporting the local community on climate change understanding and adaptation through various initiatives. Through exhibitions and public events we utilize the Lesvos Petrified Forest, a unique natural monument, to present past climate changes during the last 20 millions years. We exhibit the excavation findings as climate change indicators for the reconstruction of the paleo-environment and the paleo-ecosystems and to demonstrate the severe consequences of the past climate changes that led to the extinction of many plants and animals. Through educational programs and activities on climate change we transform the Lesvos Geopark to a learning platform on climate change for the young generation. On 2021 Lesvos island UGGP designed and organised an exhibition entitled “ Understanding Climate Change: Exploring the consequences in the geological record. Cenozoic ecosystems and the current threat”. The aim of the exhibition is to introduce to the public the unique natural monument of Lesvos, the Lesvos Petrified Forest, and to raise public awareness on climate change through presenting past climate changes and their consequences. It explores the question about the impacts that climate change has on ecosystems during the history of Earth. Using the example of the Petrified Forest of Lesvos in Greece, we convey how we can learn from the processes that have repeatedly changed our planet over millions of years to shape our own future. The exhibition includes impressive parts of petrified tree trunks, leaves, branches, roots, fruits and volcanic rocks, as well as detailed information material about the Lesvos Petrified Forest. All these exhibits are indicators of past climate changes. The visitors have thus the opportunity to understand in depth the history of the Earth and how climate systems have worked. The information materials lead them to realize how humans are currently massively intervening in these large-scale and long-term processes and which might be the potential impacts of such interventions. The exhibition is held at Messel Pit Fossil Site, an Unesco World Heritage Site, in collaboration with the Geo-Naturpark Bergstraße-Odenwald Unesco Global Geopark from July 10th 2021 to 15th May 2022. Unesco Global Geoparks can effectively join forces in the fight against climate change by organising a variety of engaging activities and events. For example, this exhibition could travel to other Unesco Global Geoparks and be part of the Unesco Global Geoparks’ campaign to raise awareness on climate change and biodiversity loss around the world and their effort to contribute to climate change mitigation through education and sustainable regional development.

**Keywords:** Lesvos Petrified Forest, Climate Change Indicators, Sustainable Development Goals, Geoparks Networks, Museum Exhibitions

**Corresponding author:** apav lids@gmail.com

**Reference:**

<https://www.ruritage.eu/news-events/exploring-the-consequences-of-climate-change-in-the-geological-record-an-international-exhibition/>

## The Case Study of Build Back Better at Aso UGGp: The Geotourism Reconstruction Process After the Massive Earthquake

*Katsunori TOYOMURA<sup>1\*</sup>, Koki NAGATA<sup>2</sup>,*

*Aso Volcano Museum<sup>1</sup> Japan, Aso Geopark Promotion Council Office<sup>2</sup> Japan*

Aso Volcano Museum is a private foundation museum that focuses on volcanology for 40 years. It is a main facility that has been involved in the Geopark activities and Education programs in Aso from the dawning age. However, the 2016 Kumamoto earthquake brought a huge impact and change on the Aso Volcano Museum's educational Geotours. [Recovery period: 2016-2017]. In the case the large-scale disaster occurs, everything begins with the extreme situation of personal "survival" and the "collapsed" museum. The challenge was how to reconstruct as a museum without exhibits in the building. Therefore, we developed a field trip program to meet the demand that people want to look at the damaged area. From 2016 to 2017, more than 3,000 people took advantage of this tour, which was very important for the museum economically, as there were no general visitors expected. [Reconstruction period: from 2018 to 2020] After 2018, the tour was evolved from "damage description" to "earth science processes and disaster preparedness". This change is due to the fact that the people's interest of affected areas decreased dramatically over the past year. Moreover, we could use the Geopark programs effectively. After the disaster, the Aso Geopark office and the Geoguides took the lead in actively conducting surveys in the affected areas. The result was provided to museum curator immediately. The curator was able to evolve the implement programs because the Geoguides had a background in earth science before the disaster. More than 19,000 people have participated in these programs from 2018 to 2020. Hence, Geopark is a program that can be of great help in disaster recovery and reconstruction. As one of the geoparks that has been affected by a large-scale disaster, we would also strongly recommend that other Geoparks and Aspiring areas value human relationships between stakeholders and Geoguide.

**Keywords:** Earthquake, Museum Education, Geo-hazard, build back better, Sendai Framework for Disaster Risk Reduction

**Corresponding author:** [toyomurak@asomuse.jp](mailto:toyomurak@asomuse.jp), [info@aso-geopark.jp](mailto:info@aso-geopark.jp)

**Reference:**

## Strategies to reduce volcanic risk in a resilient Geopark

*Cayetano GUILLÉN MARTÍN<sup>1</sup>, Carmen ROMERO RUIZ<sup>2</sup>, María Isabel BETANCORT DELGADO<sup>3</sup>, María Elena MATEO-MEDEROS<sup>3\*</sup>, EUTUR.UNIVERSITY SCHOOL OF TOURISM<sup>1</sup> Spain, DEPARTMENT OF GEOGRAPHY.UNIVERSITY OF LA LAGUNA<sup>2</sup> Spain, LANZAROTE AND CHINIJO ISLANDS UGGP<sup>3</sup> Spain, LANZAROTE AND CHINIJO ISLANDS UGGP<sup>3</sup> Spain*

Volcanoes are emblematic elements of the landscape of Lanzarote. Their presence is a clear reminder of the relevance volcanoes have on the island as a whole, and overall, in all the Canary Islands. Ongoing efforts on behalf of the local society to adapt to a volcanic land, have led them to be able to find a valuable source in the resources of nature, resulting in a unique culture, and raising awareness regarding the landscape, the values and even limiting factors. Lanzarote and the Chinijo Islands are a unique true role model of places where the geological features of an island can be respected. Some of them have helped when it comes to the area being recognised as a Geopark. However, living on a volcanically active island, poses a clear threat when carrying out normal lives and when managing the island. In this regard, volcanism has evidently become a source of wealth, although the possibility of a new eruption process is a collective challenge that this society must be ready to face. Ever since 2019, the Lanzarote and Chinijo Islands Geopark have promoted a series of actions aiming to contribute to the reduction of volcanic risk on the island, in order to have a more resilient society with a higher capacity to respond. Up until now, those actions have had a double goal: To improve the capacity to understand the volcanic phenomenon in Lanzarote, as well as raising awareness regarding the importance of a Plan of Action when facing possible eruptions in the future. To help understand the concepts of danger, risk and vulnerability. The implementation of this line of work is based on four essential facts: 1. The Canary Islands are volcanically active (Lanzarote has had historic eruptions in the past three hundred years. One of them was the longest active period on the islands). 2. The islands are geographically limited, fractioned and they are far when it comes to state resources available to help face volcanic emergencies, which limits a possible immediate response. 3. The islands' population is on the rise, which has led to a clear increase of people exposed to possible volcanic threats in the past few decades. 4. On the island, there is a clearly low perception of the volcanic risk, due to the low frequency of eruptive episodes, which makes our society more vulnerable when it comes to facing this type of situations. To date, all activities have been aimed at professionals, closely linked to the emergency management on the island of Lanzarote. For instance, the talks on how to "Reduce Volcanic Risk; from knowledge to planning, that took place in 2019, in pre-pandemic times. Throughout 2022, the aim is to resume that line of work, expanding the profile of the target audience so everyone can become aware. If our society is trained, well informed and aware of the nature that surrounds us, they shall be capable of reducing the impact of threats in nature.

**Keywords:** Lanzarote, volcanic risk, Geopark, Resilience

**Corresponding author:** cayetano.guillen@eutur.es

**Reference:**

Cayetano Guillén Martín: cayetano.guillen@eutur.es (First author) María Elena Mateo Mederos: geoparque@cabildodelanzarote.com (presenting author)

## Depositional ages and provenance of the Upper Cretaceous Dadaepo Formation in the Dadaepo Basin, Busan, South Korea

CHAE Yongun<sup>1\*</sup>, HA Sujin<sup>1</sup>, JOO Youngji<sup>2</sup>, KANG Heecheol<sup>1</sup>, LIM Hyounsu<sup>1</sup>,

*Pusan National University<sup>1</sup> Republic of Korea, Pusan National University<sup>1</sup> Republic of Korea, Pukyong National University<sup>2</sup> Republic of Korea, Pusan National University<sup>1</sup> Republic of Korea, Pusan National University<sup>1</sup> Republic of Korea*

The Late Cretaceous Dadaepo Basin is distributed on a small scale in the southern part of the Busan Metropolitan City, South Korea, and it is bordered by the Yangsan Fault to the west and the Dongnae Fault to the east. The basin is a pull-apart basin formed by sinistral strike-slip movement of these faults. The Dadaepo Formation, which is basin-fill, is largely divided into the lower Dadaepo Formation deposited from the alluvial fan to plains and the upper Dadaepo Formation deposited from the lacustrine, and there is a massive pyroclastic rock (ignimbrite) between them with a thickness of about 2.5 m. In previous study, the whole-rock Ar-Ar ages of the dacitic rocks below the lower Dadaepo Formation and the basaltic andesite lava flow above the upper Dadaepo Formation were reported to be about 94 Ma and 69 Ma, respectively (Cho et al., 2011). However, the depositional age of the Dadaepo Formation is still in debate. In this study, therefore, detrital zircon U-Pb dating was performed to obtain information on the maximum depositional ages and sediment provenance of the Dadaepo Formation. Samples were collected from the upper (01DP-1, 01DP-3) and lower (11DP-1, 01DP-6, 01DP-4) Dadaepo formations and pyroclastic rocks (11DP-2) at the boundary. Then, zircon grains were separated from the collected samples and their U-Pb ages were measured using LA-MC-ICPMS equipment in the Korea Basic Science Institute (KBSI). From a total of 432 analytical points, 416 valid points were obtained, excluding points showing discordance of 10% or more. Except for 11DP-2 and 01DP-1 samples, most samples show wide age ranges from Precambrian to Cretaceous. In particular, Permian ages (299-252 Ma) were obtained in the 11DP-1 (29 points), 11DP-2 (2 points), and 01DP-6 (2 points) samples. Rocks showing especially the Early to Middle Permian age are mostly located in the SW part of the Japanese archipelago and near the eastern coast of the Korean Peninsula, so it is very likely that the zircons originated from the eastern part of the Dadaepo Basin. It is believed that this can be determined more reliably through further study on chert clasts including radiolarian fossils from the lower Dadaepo Formation. From the youngest zircon age cluster in each sample, the maximum depositional ages of the Dadaepo Formation were calculated to be ca. 98 (01DP-4), 97 (01DP-6 and 11DP-1) Ma in the lower Dadaepo Formation, ca. 94 (11DP-2) Ma in the boundary pyroclastic flow, and about 93 (01DP-1 and 01DP-3) Ma in the upper Dadaepo Formation.

**Keywords:** Busan Geopark, Dadaepo Basin, zircon U-Pb dating, Provenance, Paleogeography

**Corresponding author:** chae@pusan.ac.kr

**Reference:**

Hyeongseong Cho, Jong-Sun Kim, Moon Son, Young Kwan Sohn and In-Soo Kim, 2011, Petrography and <sup>40</sup>Ar/<sup>39</sup>Ar ages of volcanic rocks in the Cretaceous Dadaepo Basin, Busan: Accumulation time and correlation of the Dadaepo Formation. *Journal of the Geological Society of Korea*. v. 47, no. 1, p. 1-18

## Geological Characteristics of the Yanggu Terra alba Used for a Major raw Material of the Joseon White Porcelain

CHOI Donwon<sup>1\*</sup>, KIM Hyeongsoo<sup>2</sup>,

Gangwon Province<sup>1</sup> Republic of Korea, Korea University<sup>2</sup> Republic of Korea

The Yanggu terra alba, a geosite in Gangwon Peace Area National Geopark, occurs on the Bangsan-myeon, Yanggu-gun, Gangwondo, and used for a major raw materials of the Joseon White Porcelain based the historical literatures of the Joseon Dynasty. However, there are no study results for geological characteristics of the terra alba and protoliths. Thus this study aims to understand origin and formation of the Yanggu terra alba based on the geological features including rocks and mineral compositions and their structure. The Yanggu terra alba occurs within fault zones that mainly composed of the Precambrian quartz- and biotite schist, and the Jurassic biotite granite as protoliths. The terra alba mainly composed of quartz, muscovite (illite), chlorite, feldspar, calcite, and kaolinite. The grains are poorly sorted and displays subangular to angular in roundness. Muscovite (illite) has probably formed by hydrothermal alteration of feldspar and biotite in the protoliths. Therefore it suggests that the Yanggu terra alba has formed as fault gouge. In general terra alba and yellow soil used for materials of porcelain has generated from a residual deposit, but the Yanggu terra alba used for materials of the Joseon White Porcelain has uniquely formed by hydrothermal alteration and shearing associated with faulting. In the future, it is necessary to compare it with Cheongsong terra alba in Cheongsong Global Geopark.

**Keywords:** Yanggu terra alba, fault gouge, hydrothermal alteration, illite, Joseon White Porcelain

**Corresponding author:** cave4@korea.kr

**Reference:**

Ahn, S. and Hwang, H., 2013, Study of material characteristics by a componential analysis on the whiteware from the Kiln of Chiljeon-ri, Bangsanmyeon, Yanggu-gun. *Journal of Conservation Science*, 29, 261-277 (in Korean with English abstract).  
Song, K.-Y. and Cho, D.-L., 2009, Geological report of the Mandaeri sheet (1:50,000). Korea Institute of Geoscience and Mineral Resources, 60 p (in Korean).

## Research on Geodiversity of Korea: Another Beginning

JUNG Seungho<sup>1\*</sup>,

*National Research Institute of Cultural Heritage, CHA<sup>1</sup> Republic of Korea*

Since 2010, the National Research Institute of Cultural Heritage of CHA has been conducting field research on geodiversity by region to discover and promote new resources (geology, topography) with high national conservation value. Starting with the Gangwon-do in 2011, the results for Gyeongsang-do, Chungcheong-do, Jeolla-do, Gyeonggi-do, Jeju-do (planned in 2022) were sequentially released. Through reviews of literature materials (e.g., ancient books and old maps) in advance, and numerous field surveys conducted with local historians and geology and topography experts, new geological heritages (265 cases) in various subfields were newly discovered. GIS distribution maps of cultural heritage have already been established and information on the remaining areas is provided to the public, whereas the distribution map construction project for geological heritages, which are also managed as buried cultural properties, has only recently started. Accordingly, the undesignated geological heritage obtained from the geodiversity survey in Korea is used as data in the distribution map construction project for systematic conservation and management. In the case of point-level fossil and rock specimens, basic work is underway to prepare an integrated database through a series of procedures in accordance with the Buried Cultural Heritage Act and securing an inventory. In addition, by conducting regular monitoring of major geological heritages (natural monuments) that are exposed to the outdoors and vulnerable to natural disasters and climate change, efforts are being made to respond appropriately to each site condition and type. In the future, the purpose is to prepare conservation and management measures suitable for each heritage's characteristics. Despite such wide distribution and diversity of geological heritage including fossils, caves, and special terrain, the public's interest or awareness of geological heritage is very low compared to tangible and intangible cultural assets, and they have been relatively marginalized due to development and economic logic. Therefore, a multifaceted approach is needed to systematize their conservation and management and to revitalize natural heritage.

**Keywords:** Geodiversity of Korea, Natural Heritage, GIS distribution map, Buried Cultural Properties

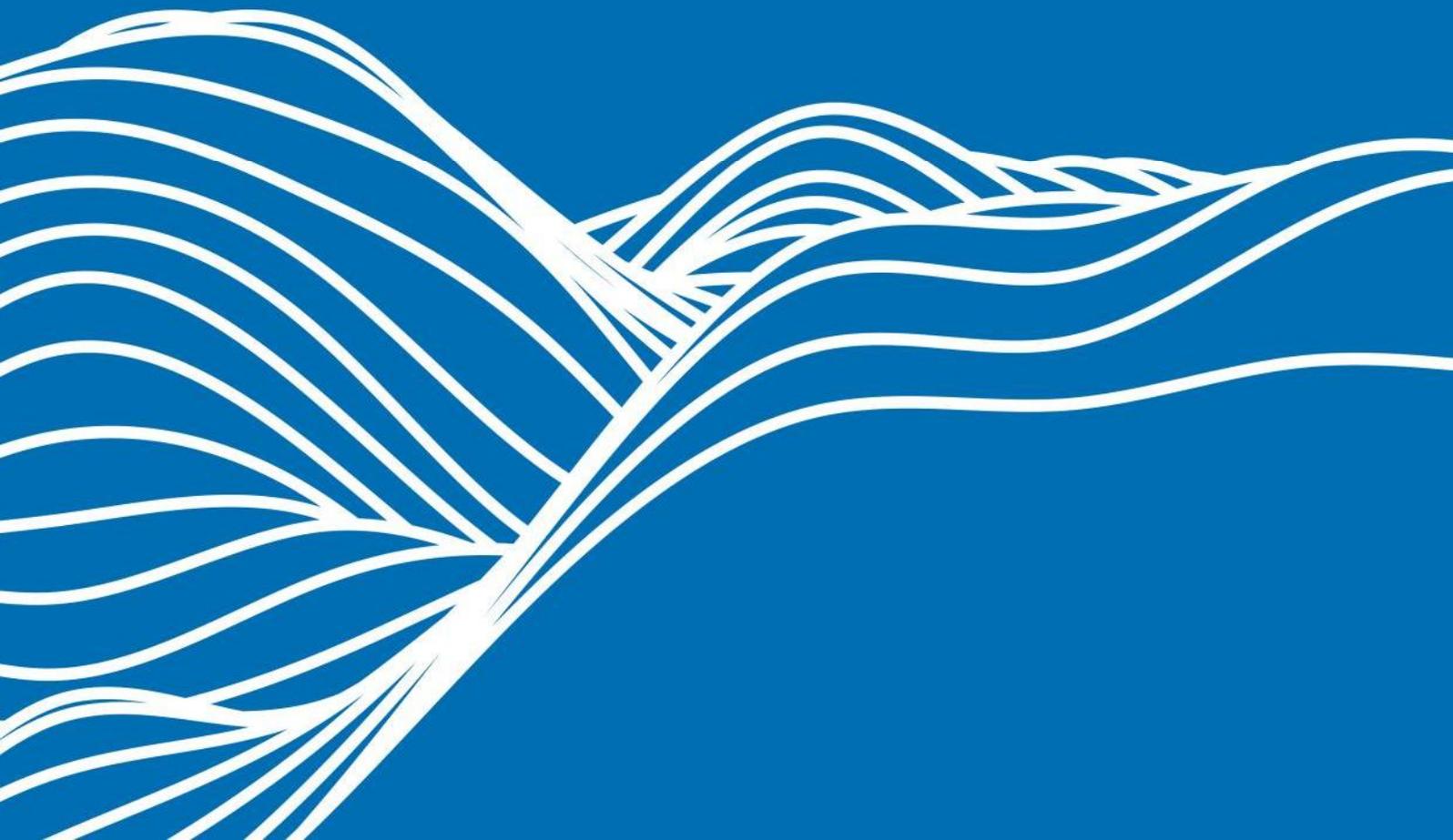
**Corresponding author:** jungsho@korea.kr

**Reference:**

This study was carried out through the Research on Geological Diversity on the Korean peninsula and Natural Monument Fossil Sites (NRICH-2105-A15F-1) of the National Research Institute of Cultural Heritage, CHA.

DIGITAL 9<sup>th</sup> International Conference  
on UNESCO Global Geoparks

# Author Index





## Author Index

Name	Page	Name	Page
Eeva AARREVAARA	178	Isabelle AUBRON	169
Sharina ABDUL HALIM	29	Jacques AVOINE	118, 169
Driss ACHBAL	45, 85, 149	Ahmet Serdar AYTAÇ	111
Adjie ACHMAD RIDWAN	262, 276	Patrícia AZEVEDO	103
Ikhwannur ADHA	249	Norzaini AZMAN	199
Prima Mulyasari AGUSTINI	90	Wataru AZUMA	145
Norhayati AHMAD	29, 92, 199	Laura BAILLET	169
Jinsu AHN	295	Urška BAJEC RUPNIK	158
Kaisar AKHIR	185	Daniel BALLESTEROS	82
Martín ALEMPARTE	82	Patrizia BALZARINI	133
Maaria ALÉN	79	Jihong BAO	264, 272
Djamil AL-HALBOUNI	248	José María BARRERA MARTIN MERAS	229, 236, 293
Che Aziz ALI	92, 199	Antonio BARTELLETTI	215
Sofia W. ALISJAHBANA	90	Sarah BEHN	188
Mauro ALIVERNINI	57	Larissa BELAN	216
Aniello ALOIA	140	Leah BENETTI	86
Osama ALRABAYAH	248	Jenny BENNETT	212
Alessia AMORFINI	215	Konstantina BENTANA	45, 131, 132, 217, 297
Sunyoung AN	198	Verónica BERNARDO	153
Alexandru ANDRASANU	194, 203, 204	María Isabel BETANCORT DELGADO	299
Emmanouil ANTONAKIS	155	Faruk BİNGÖL	111
Ana ARAÚJO	255	Vincent BIOT	100
Mohd Hariri ARIFIN	98		

Name	Page	Name	Page
Dimitrios BLOUKAS	131	Alexandros CHATZIPETROS	277
Ekaterina BOGDAN	216	Mengting CHEN	27
Jaime BONACHEA	250	Fang CHEN	32
André BORBA	252	Qian CHEN	66
Maria BOURBOULI	114	Runze CHEN	137
Nicolina BOURL	114	Jinxin CHEN	138, 267
João BRANCO	103	Siyuan CHEN	268
José BRILHA	41	Donwon CHOI	301
Theodore BROWN	146	Jooah CHOI	287
Viola Maria BRUSCHI	117, 220, 283	Michalis CHRISTODOULOU	162
Dana BUDIMAN	290	Athanasia CHRONI	225
Robert BURNS	123	Helga CHULEPIN	172
Inês CABAU	110	Spina CIANETTI	215
John CALDER	45, 188	Maša ČIBEJ	136
Hugo CAMPOS	260	Cristian CIOBANU	203, 232
Jasmine CARDOZO MOREIRA	123	Drake CIRCUS	212
Meredith CASPELL	44	Bonnie COOLE	63
Maria Manuela CATANA	208	Iván CORTIJO	229, 236, 293
Clément CAZÉ	237	Manuel Paulino COSTA	157, 271
Erika CECILIA	107	Pauline COSTER	170
Antonio CENDRERO	220, 283	Crockernwell COURT	212
Lucas CEZAR	38	Maria Luiza CRETESCU	203, 232
Beomgeun CHA	198	Emanuel DE CASTRO	38, 103, 104, 157, 221, 270, 273, 288
Yongun CHAE	254, 300	Claudia DE LUCA	81
Yu Nam CHAN	97	Max DECK-LÉGER	35

Name	Page	Name	Page
Tuncer DEMIR	202	Naomi FOSTER	231
Alline DIAS	222	Cesar FUENTES-CAMPUZANO	42
Yuning DING	196	Yuki FUJIHARA	289
Yen Ngoc DO THI	49	Risako FUJITA	109
Huyen DOAN THI NGOC	49	Takayuki FUKUDA	50
Eamon DOYLE	167, 211	Adele GARZARELLA	173
George DRAKATOS	114	Sara GENTILINI	36, 81, 191, 274
António DUARTE	157	Dina GHIKAS	39
Amrine DUBOIS GAFAR	119	Carol GLEESON	105, 211
Hieu DUONG	163	Maria Carolina Villaça GOMES	127
Wolfgang EDER	183	Denise GORFINKIEL	172
Daniel EINARSSON	294	Mojca GORJUP KAVCIC	205
Nina ERJAVEC	235	Gabriel GOYANES	288
Cristóbal ESTAY DASKAM	124	Gabriel Alejandro GOYANES DIAZ	270
Suzana FAJMUT-ŠTRUCL	78	Caleb GRANT	43
Jieting FAN	160	Murray GRAY	41
Charalampos FASSOULAS	81, 159	Felipe GUADAGNIN	252
Mega FATIMAH ROSANA	262	Cayetano GUILLÉN MARTÍN	299
Li FENG	65	Thaís GUIMARÃES	45
Peng FENG	74	Oliver GULAS-WOEHRI	99
Magda FERNANDES	38	Erdal GUMUS	112, 168
Patrícia FERREIRA	252	Aditia Batara GUNAWAN	186
Adriano FIGUEIRÓ	253	Gustavo GUTIERREZ	117, 220, 283
José Francisco De Sousa FIGUEREDO	106	Sujin HA	254, 300
Tobias FISCHER	147	Hai HA QUANG	72

Name	Page	Name	Page
Mohamad Sapari Dwi HADIAN	291	Min HUH	198
Petros HADJICOSTAS	162	Ryosuke IKENAGA	197
Christodoulos HADJIGEORGIOU	162	George ILIOPOULOS	154
Ding HAIYANG	285	Paula Naomi IRAPTA	296
Furzannie HANNA	244	Sawako ISHIHARA	91
Meiying HAO	174	Abd Rasid JAAPAR	92
Malcolm HART	212	Jamaluddin JAMALUDDIN	249
Gerald HARTMANN	78	Jenni JELKÄNEN	55
Perry HARTWICK	125	Xiaochi JIN	45
Qingcheng HE	174	Fa-is JINDEWHA	93
Charles HELM	34	Zhixing JING	265
Cahit HELVACI	112	Jóhannes M. JÓHANNESSON	60
Ángel HERNÁNDEZ	237	Young Ji JOO	254, 300
Javier HERNÁNDEZ	250	Seongok JU	46
Patricia HERRERA	200	Jongyun JUNG	198
Vinh HOANG	210	Seungho JUNG	246, 302
Pao HOANG	210	Sophie JUSTICE	58, 133, 191
Chi HOANG THI PHUONG	72	Nire KAGAYA	242
Duc HOANG XUAN	49	Konstantinos KAISARIS	54
Sana HONJO	278	Manaka KAJIOKA	109
Xiaokang HU	165	Yoshihiro KAKIZAKI	30
Wen HUANG	142	Garyeong KANG	254
He-qing HUANG	144, 219	Heecheol KANG	300
Qingsong HUANG	164	Suna KANG	52
Tao HUANG	184	Sakurako KANOUE	278

Name	Page	Name	Page
Birgit KAUSCH	177	Christophe LANSIGU	61
Ute Lies Siti KHADIDJAH	291	Tanguy LEBLANC	237
Daewoo KIM	279	Jusuk LEE	295
Hogeun KIM	295	Seungyeon LEE	251
Hyeongsoo KIM	301	Yuri LEE	198
Yewon KIM	295	Stéphane LEGAL	170
Georgia KITSAKI	286	Maria Juliana Ferreira LEITE	106
Mikko KIUTTU	56, 133, 263	Kirstin LEMON	213
Takeo KOBAYASHI	146	Guiqing LI	32
Maria KOLENDRIANOU	114	Wei LI	137
Darja KOMAR	78	Xia LI	174, 196
Ibrahim KOMOO	92, 199	Jiangfeng LI	195
Kati KOMULAINEN	55, 79	Yue LI	292
Konny KOOB	194	Hyounsu LIM	254, 300
Tvrtko KORBAR	135	Wensheng LIN	28
Barnabas KORBELY	156	Qigang LIN	284
Kyösti KOSKELA	56	Flavi LISBOA FILHO	253
Veronika KOUKAL	249	Hanke LIU	144
Eleni KOUMOUTSOU	154	Javier LÓPEZ CABALLERO	101, 293
Panagiota KOUTSOUKOU	54	Fábio LOUREIRO	273
Vesa KRÖKKI	56	Qinfei LU	88
Takayuki KUBO	218	Chunyu LU	281
Ari KURNIA	186	Inês LUCAS	83
Alfredo Mahar Francisco LAGMAY	296	Ian LUCAS	125
Aggelos LAMPRAKOPOULOS	214	Vegard LUND	151

Name	Page	Name	Page
Thuy LY	75	Luis Javier MEDIAVILLA CALDERÓN	77
Yidong MA	32	Carlo MELETTI	215
Manda MAGGS	34	José Patricio Pereira MELO	45, 187
Everson De Araújo MAIA	106	Francisca Jeanne Sidrim De Figueiredo MENDONÇA	106
Luis MAMPEL	237	Salomé MENESES	271
Kalle MÄNNISTÖ	64	Yao MENG	284
Jovana MARINKOVIĆ	161	Bianca MIHAILA	203
Emma MARJAMÄKI	55	Eli Jamilah MIHARDJA	90, 186
Josefiina MAROLA	55	Panagiotis MINETOS	114
Maria MARQUES	37	Xavi MIR	82
Michel MARQUES	152	Danijela MODREJ	78
Heikki MARTIKAINEN	116	Azmil Munif MOHD BUKHARI	199, 209
José Manuel MARTINHO LOURENÇO	171	Jesús MOJAS	117
Guy MARTINI	45	Antónia MORAIS	157
João Serrão MARTINS	255	Ana MORIES	255
Rapidah MAT STAFA	92	Margarida MOTA	103
María Elena MATEO-MEDEROS	299	Delminda MOURA	258, 259
Ryuji MATSUZAWA	146	Bjørn Magnus MOWINCKEL NILSEN NARUM	245
Jack MATTHEWS	41, 128	John MULLIGAN	125
Bradley MAY	44	Son MUNYEONG	295
Susan MAY	280	Hiroo MURAKAMI	76
Patrick MC KEEVER	141	Koki NAGATA	76, 218, 298
Melinda MCHENRY	224	Betti Betharia S. NAIBAHO	68
Duncan MCILROY	63	Setsuya NAKADA	207
Christopher MCKEAN	63		

Name	Page	Name	Page
Akifumi NAKAMURA	30, 206	Haritakis PAPAIOANNOU	277, 286
Suzuno NAKASHIMA	109	Togu PARDEDE	185
Guy NARBONNE	141	Panagiotis PASCHOS	277
Carlos NETO DE CARVALHO	208	Athina PAVLIDOU	297
Young NG	183	Irina PAVLOVA	81
Nam NGUYEN THI QUE	72	Alexandra PAZ	153, 191, 201
Emmanouel NIKOLAKAKIS	159	Kamilla PEDERSEN	263
Evangelos NIKOLAOU	277	Jichao PENG	108
Hajime NISHII	278	Bruno PEREIRA	37, 83, 110
Minamo NOBE	51	Ana PEREIRA	37
Marketta NUMMIJÄRVI	134	Rita PEREIRA	83
João Carlos NUNES	271	Pedrina PEREIRA	152
Gráinne O CONNOR	148	Sarah PEREIRA	152
Tsubasa OGASAWARA	30, 70	Luis PEREIRA	258, 259
Takahiko OGAWARA	146	Luigi PEROTTI	133
Yutaka OKAZAKI	145, 243	Beth PETERKIN	86
Stener OLIVEIRA	252	Alain PETIT	80
Sónia OLIVEIRA	258, 259, 261	Cristina PETRACCHI	36
Alexandra ONA	223	Huong PHAM	210
Lisbeth OÑA	269	Hai PHAM MINH	49
Giuseppe OTTRIA	215	Nuno PIMENTEL	37, 83, 110
Aya OWADA	70	Andreia PINTASSILGO	255
José Luis PALACIO-PRIETO	45, 193	Ana PINTO	153
Penelope PAPADOPOULOU	154	Darren PLATAKIS	125
Ermioni Eirini PAPADOPOULOU	225	Adina POPA	194

Name	Page	Name	Page
Michał POROS	233	Carmen ROMERO RUIZ	299
Iwan PRABOWO	249	Miao RONG	48
Santi Dwi PRATIWI	33	Emmaline ROSADO-GONZÁLEZ	45, 59, 171, 193
Muhammad PRAVDA	185	Mega Fatimah ROSANA	33
Flávio PRETTO	253	Lars RÜPKE	248
Myriam PRIETO	102	Catrina RUSSELL	62
Shawna PRINCE	63	Togu S. PARDEDE	90
Anthony PRIOR CARVAJAL	124	Artur SÁ	45, 59, 84, 171, 193, 201, 282
Mary PULGAR	223	Cristian SALAS	200
Guillem PURAS	82	Karmah SALMAN MONTE	77
Daniela QUIROZ	223	Edith SAMSON	63
John RAE	122	Jose Luis SANCHEZ CORTEZ	42, 176, 189
Kristin RANGNES	45, 150	José Ángel SÁNCHEZ FABIÁN	77
Annie RASSIOS	39	Xiaopeng SANG	95, 196
Januarani RAZAK	53	Saprudin SAPRUDIN	166
Fang REN	40, 174	Masahiro SASAHARA	76
Patricia RENGEL	223, 269	Manuel SCHILLING	200
Sylvia REYER-ROHDE	57	Jaciele SELL	253
Bojan REZUN	205	Ilaria SELVAGGIO	133
Darren RICE	120	Berglind SIGMUNSDOTTIR	263
Michael RIPMEESTER	125	Sigurður SIGURSVEINSSON	192
Daniela ROCHA	153	Immanuel Deo Juvente Hasian SILALAH	185
Joana RODRIGUES	157, 191, 208	Miguel SILVA	37, 83, 110, 222
Bruno RODRIGUES	261	Elizabeth SILVA	45, 59, 84, 171, 282
Emilia ROMÁN	229		

Name	Page	Name	Page
Maria SILVA	152	Cristina TOMA	203, 204
Koharu SOEJIMA	76	Kaisa TÖRMÄ	64
Dody SOMANTRI	262	Katsunori TOYOMURA	298
Carmen Julia SONCCO	270, 288	Van TRAN NHI BACH	73
Nikolaos SOULAKELLIS	225	Van TRAN TAN	49, 210
Abdullah SOYKAN	112	Socrates TSACOS	154
Resit SOZER	276	Efthymios TSIOLAKIS	162
Brynjar STAUTLAND	121	Maria TSONI	114
Christos L. STERGIYOU	277	Toshihiro UCHIYAMA	146
Shew Jiuan SU	68	Inan ULUSOY	112, 168
Mario SUÁREZ ZABALA	293	Tanot UNJAH	29
Marina Tamaki De Oliveira SUGIYAMA	127	Jairo VALDATI	127
Martyna SUTOWICZ-KWIECIŃSKA	233	Ilias VALIAKOS	45, 132, 217, 297
I Gede Wiwin SUYASA	96	Macarena VALLEJOS BUSTOS	124
Endah Kartika SYAHRI	53	Benjamin VAN WYK DE VRIES	296
Vasilis SYMEOU	162	Kristof VANDENBERGHE	45
Vilma-Lotta TALLGREN	79	Liette VASSEUR	44
Tsukasa TANAKA	278	Cristina VEIGA-PIRES	255, 258, 259, 261
Georgios TATARIS	225	Nuria VERDENY	82
Paula TEIXEIRA	261	Viktor VEREB	296
Sandra TEUBER	230	Camilo VERGARA DASKAM	124
Benjamin THÉBAUDEAU	119	Pierre VERPAELST	126
Pål THJØMØE	191, 274	Michele VESTENA	253
Narongrit THUNGPRUE	93	Thùy VI TRAN	94
		Alice VIE	175

Name	Page	Name	Page
Goncalo VIEIRA	221, 270, 288	Misook YOON	279
Mariana VILAS BOAS	208	Guoan YU	219
Narimi WADA	71	Yibin YUAN	95
Michael WAGREICH	249	Shaozong YUE	266
Junbo WANG	139	Ayu Krishna YULIAWATI	291
Jianguo WANG	165	Li YUNQIAN	241
Shichao WANG	247	Avraam ZELILIDIS	114
Lulin WANG	275	Jiabo ZHANG	143
Jutta WEBER	190	Chenggong ZHANG	164
Antonia WEISSENBACHER	78	Dongwei ZHANG	247
Witold WESOŁOWSKI	233	Fan ZHANG	256
Mark WILLIAMS	224	Xiao ZHAO	219
Hannah WILLMS	87	Wenjing ZHAO	268
Winantris WINANTRIS	33	Yuanyuan ZHENG	179
Yeon WOO	198	Yiheng ZHOU	144, 219
Di WU	195	Yutong ZHU	95, 196
Michael XANTHAKIS	114	Elena ZOUMPOULI	114
Wei XIAO	32	Nickolas ZOUROS	45, 81, 131, 132, 139, 155, 214, 217, 225, 297
Kejian XU	47, 268	Zbigniew ZWOLINSKI	41
Yuemei XU	47		
Ryuta YAMAMOTO	31		
Lichao YANG	174		
Zhenzhi YANG	183		
Qingzi YE	89		
Yukino YOKOYAMA	278		