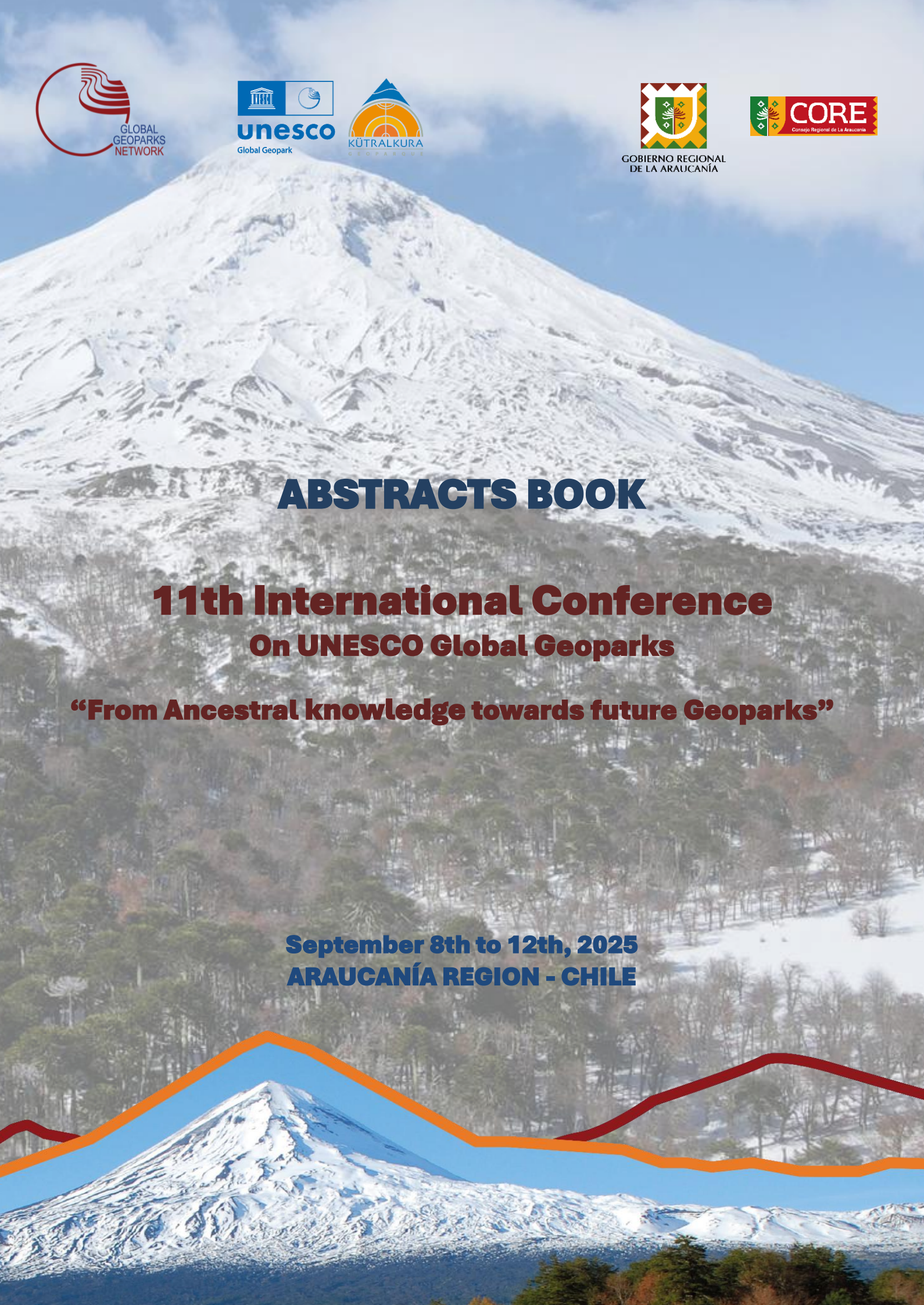


ABSTRACTS BOOK

11th International Conference
On UNESCO Global Geoparks

"From Ancestral knowledge towards future Geoparks"

September 8th to 12th, 2025
ARAUCANÍA REGION - CHILE

PRESENTATION

It is a great honor to introduce this compendium of abstracts, which documents the scientific contributions and management practices shared during the 11th International Conference of UNESCO Global Geoparks (GGN).

This year's 11th edition was of historic importance as it was celebrated for the very first time in the heart of South America and was hosted by the Kütralkura UNESCO Global Geopark, which is located in the Araucanía Region of Chile.

The conference was held successfully from the 8th to the 12th of September in 2025. The core theme of the event was a call to reflect on “From ancestral knowledge towards Future Geoparks”.

This premise guided the debates toward the critical need to integrate the deep traditional knowledge of local and ancestral communities with scientific innovations and best management practices. The aim was to trace a path toward a more holistic, sustainable and respectful management of global geological and cultural heritage.

These abstracts represent a valuable mosaic of research, covering the essential themes of UNESCO Global Geoparks from geoconservation, geological education, and geotourism to economic sustainability and community development.

Therefore, this compilation of abstracts stands as a fundamental resource and image of the current state of management and research in the UNESCO Global Geoparks Network by serving as an indispensable tool for the researchers, managers and professionals of this field around the world.

Organizing Committee - Executive Secretariat Conference
Executive, Technical, and Scientific Committee of the UNESCO Global Geopark Kütralkura



FOREWORD

The Global Geoparks Network was founded on the belief that science and society are inseparable, where the language of rocks, landscapes, and living traditions tells a story that belongs to all of humanity. Over the years, this vision has taken form through the tireless work of our member geoparks, scientists, educators, and communities who transform knowledge into understanding, and understanding into action. The 11 th International Conference on UNESCO Global Geoparks, held in Kütralkura UNESCO Global Geoparque (La Araucanía, Chile), stands as a living testament to that commitment.

This Book of Abstracts reflects the remarkable diversity and depth of scientific contributions shared across our global network. Within these pages are studies that span continents and disciplines: from tectonic evolution and geohazard assessment to geoconservation strategies, community-based research, and digital innovation. Each contribution, whether emerging from a volcanic landscape, a coastal cliff, or a rural valley, adds to a collective endeavor, revealing the geological memory of the Earth and connecting it meaningfully with human life.

UNESCO Global Geoparks are, at their heart, territories of science. They are dynamic observatories where geological heritage is studied not as a relic of the past, but as a guide for the future. Here, research meets education, and education inspires stewardship. Scientists, teachers, and localcommunities work side by side, observing, measuring, and learning from the land. This collaborative spirit tr ansforms geoparks into laboratories of sustainability, places where evidence informs decision- making and where curiosity drives resilience in the face of global change.

The Global Geoparks Network continues to affirm its role as a platform of excellence and inclusion, where high-level scientific research finds purpose in service to people and the planet. The dedication of our members demonstrates that rigorous science and human creativity can coexist in harmony, shaping new models of coexistence between nature and culture. Every investigation published here, including every dataset, field observation, and interpretive insight, reinforces the recognition of UNESCO Global Geoparks as trusted territories of knowledge, open to the world and accountable to their communities.

As we look ahead, the challenge and the opportunity remain the same: to deepen our scientific understanding while amplifying its impact through education, innovation, and international cooperation.

The studies gathered in this volume remind us that the Global Geoparks Network is more than a collection of sites; it is a living scientific movement rooted in solidarity, inspired by the Earth itself. May this book stand as both a record of achievement and a call to continue exploring, questioning, and protecting the geological foundations of our shared home.

Artur A. Sá
President of the Global Geoparks Network

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PROJECTS AND ASPIRING GEOPARKS



VIANA CASTELO LITTORAL ASPIRING GEOPARK: ONGOING WORK TOWARDS UNESCO

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Keywords: education, geoconservation, geoheritage, geopark, geotourism

The Viana do Castelo Littoral Aspiring Geopark covers the entire municipality of Viana do Castelo, comprising 320 km2 onshore and 220 km2 offshore (totaling 540 km2). Now in its 20th year, the initiative is in its final phase of preparation for submission to the UNESCO Global Geoparks Network, expected in late 2026. It represents an integrated approach to geoconservation, scientific research, environmental education, and sustainable territorial development.
At its core lies a network of 32 geosites, spanning geological time from Early Cambrian to the present. These are key resources for research, curricular innovation, and geotourism. They illustrate major themes in Earth's history: a) the formation of the Rheic Ocean during the Paleozoic; b) its closure and the structuring of the Variscan basement with associated magmatism; c) the opening of the Atlantic Ocean and development of modern landforms and drainage; d) palaeoenvironmental and climatic evolution over the last 340,000 years; e) tectonic reshaping over 425,000 years; and f) the human imprint on the landscape.

The geopark was formally established in 2016 through a multi-institutional protocol involving universities, research centers, civil society, and local authorities. In 2022, it joined the Portuguese Network of UNESCO Global Geoparks as an observer and has since contributed to joint initiatives. Since 2024, the Municipality of Viana do Castelo has assumed full management, ensuring technical coordination and strategic continuity. Governance includes a Municipal Geopark Council with 27 civil parishes and 15 stakeholder institutions.

Key scientific and educational infrastructures include: a) the School Science and Research Support Network (since 2018), with eight school-based laboratories involving over 12,500 students; b) the Observatories Network (2021–2023), with three thematic facilities - Coastal, River, and Mountain - supporting citizen science and environmental monitoring; c) a Heritage Interpretation System with more than 160 physical elements and immersive digital platforms; and d) the Geopark Gateways, visitor centers promoting the identity of the Neiva Valley, Arga Mountain, and Atlantic Coast.

Geoconservation efforts include the legal designation of scientifically significant geosites as Local Natural Monuments and an ecological maintenance protocol involving 24 local companies, reflecting a participatory stewardship model. The project's scientific and educational impact has earned national recognition, including two awards from ProGEO Portugal, and distinctions from the Portuguese Confederation of Environmental Protection Associations and the Ministry of Education for its role in the "Ciência Viva" school program.

Aligned with UNESCO principles, the Viana do Castelo Littoral Aspiring Geopark offers a robust model of holistic development rooted in geoscience, education, and sustainability. It now seeks international recognition as a UNESCO Global Geopark.

THE IMPACT OF THE EVALUATION MISSION PREPARATIONS ON THE INTERNATIONALIZATION OF MINÉ-AKIYOSHIDAU KARST PLATEAU ASPIRING UNESCO GLOBAL GEOPARK

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Keywords: Miné-Akiyoshidai Karst Plateau Geopark, aspiring UNESCO Global Geopark, evaluation mission, internationalisation

Miné-Akiyoshidai Karst Plateau aspiring UNESCO Global Geopark is located in western Japan and covers an area of 472 km^2. The Geopark consists of a basin area that is surrounded by mountains of around 700 m elevation, and has a warm and humid climate. It was recognised as a Japanese national Geopark in 2015, and is currently an aspiring UNESCO Global Geopark.

Miné-Akiyoshidai Karst Plateau Geopark is located in the centre of Yamaguchi Prefecture, and is 100 km away from Fukuoka, one of the major cities of Japan. The Geopark area has an aging population, with 45% of the territory's population being aged 65 or above. The secluded location of the Geopark and its aging population may account for the low number of non Japanese visitors and residents that the Geopark has historically experienced, compared to other parts of Japan. This has resulted in a slow rate of internationalisation, which is reflected in the lack of multilingual signage and speakers who are fluent in two or more languages.

Ever since its establishment, Miné-Akiyoshidai Karst Plateau Geopark has played a vital role in the internationalisation of the region. The Geopark has resulted in an influx of international travellers, as well as an interest amongst local residents who are involved in Geopark activities to connect with people from other cultures and to convey the values of the Geopark on a global scale. This shift from indifference to enthusiasm, in regards to internationalisation, has been most prominent since Miné-Akiyoshidai Karst Plateau Geopark began its UGGp application process in 2024. The impacts of this shift have been observed at the Geopark Centre where the Secretariat is based, amongst geoguides, and also amongst local residents.

Firstly, the preparation period for the UGGp evaluation mission has resulted in the creation of many bilingual resources and the expansion of "English Friday". The Secretariat introduced "English Friday", where staff are encouraged to use English as their working language on Fridays, in 2023, and this has been expanded to three days a week in order to prepare for the evaluation mission.
Secondly, change has been observed amongst geoguides (certified local residents who give geotours of the Geopark), who have worked tirelessly to design multilingual and non-verbal resources and have practised giving geotours in English, in order to communicate the significance of the Geopark to a wider audience. The Secretariat has assisted this initiative by collaborating with Mine City to arrange English-speaking practice with municipal Assistant Language Teachers.
Finally, local residents have also begun to show a keener interest in getting involved with the Geopark's international activities. One example is the collaboration between a Geopark partner company that hires Vietnamese employees, where the employees performed a Vietnamese dance at a Geopark event to promote cultural diversity.

GEOHERITAGE FROM CORUMBATAÍ GEOPARK PROJECT SÃO PAULO STATE, BRAZIL

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Keywords: Project Geopark, geological heritage

The Corumbataí Geopark Project is located in a territory in the interior of the São Paulo state, southeast region of Brazil. It involves the municipalities of Analândia, Charqueada, Cordeirópolis, Corumbataí, Ipeúna, Itirapina, Piracicaba, Rio Claro, and Santa Gertrudes, with a total population of 720,164 inhabitants according to the most recent census, from 2022, in an area of approximately 3,100 square kilometers. The geological history of this territory dates back approximately 300 million years, mainly through the Paraná Sedimentary Basin, with sedimentary and magmatic rocks dating from the Carboniferous/Permian periods (Itararé Group) to the Neogene/Paleogene (Rio Claro Formation). Also noteworthy from a geomorphological point of view is the landscape of "cuestas" and testimonial hills, in the transition between the geomorphological relief domains of the state, with the majority of the territory located in the Peripheral Depression of São Paulo, Sandstone-Basalt Cuestas and a small part of the Western Plateau. In terms of geological heritage, the Corumbataí Geopark Project is internationally relevant because it encompasses important paleontological and hydrogeological elements. The first is justified by the type section of the Assistência Member of the Irati Formation, found in a mining front, whose exploration has been terminated, in the Assistência District, municipality of Rio Claro. The limestone rocks of the Irati Formation contain fossils of mesosaurid reptiles, a very important paleobiological evidence of the continental separation between South America and Africa, and which justify Alfred Wegener's 1912 Theory of Continental Drift. The Irati Formation is related to the Whitehill Formation (South Africa) and Huab Formation (Namibia). It is, therefore, a guide layer – an intercontinental stratigraphic landmark and a key piece in the history of the supercontinent Gondwana. *Mesosaurs* were also the first amniotes to return to the marine environment after a previous terrestrial incursion. Well-preserved specimens were found at the site and are now preserved on the territory itself, in the Museum of Paleontology and Stratigraphy of the São Paulo State University (UNESP), Rio Claro campus. The mining front will be transformed into a geological park for the preservation, dissemination and education of this important heritage. The second heritage element of the territory is the recharge zones of the Guarani Aquifer System, formed by the Piramboia and Botucatu formations (Mesozoic). This aquifer is the largest transboundary source of underground freshwater in the world and recharge areas can be found in some geosites of the Corumbataí Geopark Project, such as the Cuesta do Indio Geosite. Since 2016, the initiative has been formalized as a geopark project and it is expected that a possible application will be made in the coming years.

FEATURES AND ADVANCES IN THE PRUDENTÓPOLIS GEOPARK PROJECT, PARANÁ STATE, SOUTHERN BRAZIL

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Keywords: geotourism, geoeducation, geoconservation, Ukrainian culture

Prudentópolis is a municipality in south-central Paraná State (southern Brazil) with 2,237 km² and 51,567 inhabitants. The territory is rich in natural beauty, highlighted by dozens of waterfalls, deserving the title of "Land of Giant Waterfalls". It also features the escarpment of *Serra da Esperança*, and many butte-like testimony hills that stand out in the landscape. In 2019, the Prudentópolis Geopark Project was launched, covering the entire municipal territory. The project area lies upon rocks of the Paraná sedimentary basin, deposited during a crucial stage of Earth's history, from the peak of Gondwana stability to the moments immediately preceding the opening of the South Atlantic Ocean. The most relevant geoheritage context comprises the late Permian deposits of uppermost Gondwana I supersequence, characterized by the last marine incursions (tidal flats, lagoons with stromatolites of the Teresina Formation) and the definitive establishment of a continental environment (lacustrine and fluvial deposits of Rio do Rastro Formation). This transition from marine to continental environments is materialised by unique modifications in bivalve malacofauna and Glossopteris/conifer flora. Completing the scenario of continentalisation, Gondwana III supersequence occurs, with the fluvial deposits of the Pirambóia Formation, as well as the aeolian deposits of the Botucatu Formation and the volcanic and intrusive rocks of the Serra Geral Group, one of the most expressive Large Igneous Provinces (LIPs) on Earth. Within the territory of the Prudentópolis Geopark Project, 33 geosites (one of international relevance) are references for stratigraphic, paleontological, paleoenvironmental, and geomorphological studies, forming the basis for numerous theses and reference publications, as well as serving as a stage for didactic use in field classes for decades. Prudentópolis also holds other natural and cultural values of great relevance. Besides the giant waterfalls, the *Araucaria angustifolia* forests are a natural highlight. The territory also boasts a strong Ukrainian culture, with over 70% of its population having ancestors who immigrated to Brazil from that European country, bringing their religion, customs, language, crafts, musical instruments, dances, and cuisine. Strong cultural assets are the "*faxinais*", traditional, collective, agricultural production systems of possible indigenous roots. Archaeological sites of great scientific value, closely linked to geological features, complete the scenario. Several institutions participate in the project: Prudentópolis Mayor's Office, Institute of Water and Land (IAT), State Secretariat of Tourism, State Secretariat of Culture, State University of Ponta Grossa (UEPG), and State University of Central Paraná (UNICENTRO). To date, the following steps have been accomplished: updating the geological map to a 1:50,000 scale; inventorying the Geological Heritage; preparation and printing of geotourism panels (already installed at the sites) and brochures; geoconservation measures and geotourism/geoeducation development in one internationally relevant geosite (the *Pinheiro de Pedra* geosite); three internal workshops in different rural communities; school activities in geosites; numerous lectures; two doctoral theses; and articles for journals and scientific events. The project logo, which depicts the most important geological/geomorphological and natural features, is inspired by the Ukrainian tradition of *pêssankas*, the art of wax-painted eggshells given as presents during Easter time as a sign of appreciation.

UTILIZING THE POWER OF DESIGN: DESIGN STRATEGY AND SIGNBOARD WORKING GROUP OF SAKURAJIMA-KINKOWAN GEOPARK

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Keywords: art, design, local engagement, Project and Aspiring Geopark

Sakurajima-Kinkowan Geopark is a national Geopark located at the southernmost tip of the Japanese archipelago. Centered around the active volcano Sakurajima, which undergoes frequent eruptions, the Geopark area encompasses three municipalities.

Since before its official recognition as a Japanese Geopark in 2013, the Geopark has placed a strong emphasis on the power of design. A dedicated design team—comprising an art director, a designer, an illustrator, and a copywriter—was formed to develop a strategic approach. This resulted in the creation of a Visual Identity (VI) Manual, which outlines key branding elements such as logos, colours, and usage guidelines. All Geopark brochures and signboards adhere strictly to this manual.

In addition to the VI manual, the Geopark has established a Signboard Working Group, fostering a collaborative, bottom-up approach to creating new signboards. The working group members include the design team, Geoguides, volcanologists, accommodation managers, local NPOs, and Geopark staff. In the working group, the members discuss sites for installation and key messages of the boards.

This initiative demonstrates how Sakurajima-Kinkowan Geopark harnesses both design and local community engagement to enhance its identity and communication efforts.

CAIUÁ GEOPARK PROJECT: BETWEEN FOSSILS AND WATERFALLS, A STORY FROM THE CRETACEOUS

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Keywords: dinosaurs, geopark, waterfalls, geodiversity

The Caiuá Geopark Project is located in the northwest of the state of Paraná, in southern Brazil, and covers four municipalities within an area of 2,356 km². This territory stands out for its geodiversity, represented by geological, geomorphological, and paleontological elements that attract the attention of both specialists and tourists. The area includes fifteen Geodiversity Interest Sites (LIGs), encompassing a paleontological site, a rock outcrop, waterfalls, rapids, a biodiversity site, and areas that reflect the region's historical and cultural heritage. The paleontological site, characterized as a *bone bed* within rocks of the Caiuá Group, preservers hundreds of pterosaur fossils, with three species already identified, in addition to two species of dinosaurs and one of an acrodont lizard, constituting a significant record of the Cretaceous Period on Earth. Part of these fossils remains *in situ*, preserving their original geological context, while others are displayed at the Paleontology Museum of Cruzeiro do Oeste, which is inventoried as an *ex situ* geosite. The project also includes waterfalls and rapids formed in igneous and sedimentary rocks. Within the Caiuá Group, which is predominantly composed of eolian deposits, the Fumagalli Waterfall and the Três Cachoeiras stand out. The features associated with the Serra Geral Group are linked to Lower Cretaceous magmatic events resulting from the continental rifting process that led to the opening of the Atlantic Ocean. Fissural magmatism, controlled by geological fault systems, produced extensive volcanic flows that conditioned the formation of prominent waterfalls, such as: Salto Paiquerê, Apertado do Piquiri, Cascata do Pinhal, Cachoeira São Luiz, Corredeira Pedro Lino, Cachoeira da Pedreira, Cachoeira Tatara, and Cachoeira 40. These waterfalls exhibit diverse morphologies shaped by the type of rock and the surrounding environment, and they are situated along major regional rivers such as the Piquiri and the Goioerê which carry significant water volumes. A site of geological interest in the territory corresponds to a sedimentary deposit in sandstone with cross-stratification (*dune foresets*) under stratified layers of interdunes, representing the features of the ancient Caiuá Desert. From a biodiversity standpoint, the Perobas Biological Reserve stands out as a conservation unit that protects significant remnants of the Atlantic Forest, harboring endemic and threatened species. In terms of cultural heritage, the Imaculada Conceição Chapel, built in the 1950s, represents a symbol of the region's history and religious tourism. The Caiuá Geopark Project brings together attractions of natural and cultural heritage, promoting the appreciation of scientific knowledge, geoconservation, and sustainable socioeconomic development. Its development is expected to strengthen the identity of the local community and foster tourism and educational activities focused on waterfall conservation, while also reframing the paleontological heritage as an element of community belonging and scientific value.

TOWARDS UNESCO RECOGNITION: BUILDING A MODEL GEOPARK FOR SUSTAINABLE DEVELOPMENT IN THE SARAWAK DELTA GEOPARK, MALAYSIA

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Keywords: aspiring geopark, conservation, heritage, sustainable development

The Sarawak Delta Aspiring UNESCO Global Geopark (SDAG) is the first geopark in Sarawak, located in the southern part of Borneo, East Malaysia. Spanning an area of 3,112 square kilometers (sq km) it includes both land and water areas. SDAG is home to diverse native communities including the Bidayuh, Iban, and Malays, living in a heterogeneous landscape comprising urban, agricultural, natural forest, and conservation areas. It represents a dynamic initiative that integrates geological heritage conservation with sustainable development, education, and community empowerment.

This presentation highlights key milestones achieved in the journey towards UNESCO Global Geopark recognition, including the establishment of geopark governance; the appointment of community and school-based geopark partners; promotion & visibility; and the implementation of outreach and capacity-building programs. Special emphasis is placed on the role of local communities in co-managing geosites, developing interpretive materials, and promoting geotourism initiatives that celebrate Sarawak's rich geodiversity, biodiversity, and cultural legacy.

Through a holistic approach that combines conservation with education and sustainable livelihood opportunities, the SDAG aspires to serve as a replicable model for geopark development in Malaysia. The presentation underlines how this effort contributes not only to the safeguarding of natural and cultural heritage but also to the broader goals of climate resilience, environmental awareness, and inclusive economic growth.

SUPPORTING MINÉ-AKIYOSHIDA KARST PLATEAU ASPIRING UNESCO GLOBAL GEOPARK AS A REGIONAL GOVERNMENT, AND PROVIDING SUPPORT FOR UGGP CERTIFICATION

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Keywords: Miné-Akiyoshidai Karst Plateau Geopark, regional collaborations, inbound tourism, tourism promotion

Miné-Akiyoshidai Karst Plateau aspiring UNESCO Global Geopark is located in western Japan, in the centre of Yamaguchi Prefecture. Its area corresponds to the administrative division of Mine City, and covers an area of 472 km^2. It was recognised as a Japanese national Geopark in 2015, and is currently operating as an aspiring UNESCO Global Geopark.

Yamaguchi Prefecture has supported Geopark activities as a regional government, as well as a committee member of the Miné-Akiyoshidai Karst Plateau Geopark Promotin Council, based on their understanding that Geopark activities contribute greatly to regional development through education, research, and tourism.

Although there are no UNESCO Global Geoparks in Yamaguchi Prefecture yet, Yamaguchi Prefecture is cooperating with Mine City and related groups to concentrate their efforts on the procedures that are required for Miné-Akiyoshidai Karst Plateau Geopark to become a UNESCO Global Geopark. This is based on their understanding that the effects of the UGGp recognition will not only be felt in Yamaguchi Prefecture, but will also raise Yamaguchi Prefecture's profile and international value, as well as increase inbound tourism, which is expected to have a positive ripple effect on the entire prefecture.

In terms of specific actions taken by Yamaguchi Prefecture, when Miné-Akiyoshidai Karst Plateau Geopark decided to submit a UNESCO Global Geopark application dossier in 2024, the Miné-Akiyoshidai Karst Plateau Geopark Certification Support Committee was established. This committee provides full support to Miné-Akiyoshidai Karst Plateau Geopark for applying for UNESCO Global Geopark status, by strengthening collaboration through concrete activities such as the dissemination of information and the promotion of tourism, and has also established subsidies for expenses related to the UNESCO Global Geopark application process.

In addition, Yamaguchi Prefecture will provide focused support for efforts such as the development of a one-stop service center for outdoor tours and the planning and sales of geotours and caving tours, which will help create new attractions for Miné-Akiyoshidai Karst Plateau Geopark.
Furthermore, Yamaguchi Prefecture will position the Geopark as an important component of the workations that are offered within the prefecture, and will develop family workcations that have a Geopark theme.

Yamaguchi Prefecture will continue to support Geopark activities in cooperation with Miné Akiyoshidai Karst Plateau Geopark, and will promote the development of the entire prefecture by utilising its world-class regional resources.

GEODIVERSITY, CULTURE, AND COMMUNITY THE FUTURE VISION OF NANKI KUMANO GEOPARK

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Keywords: geodiversity, cultural landscape, community engagement, disaster risk reduction

The Nanki Kumano Geopark is located in a region where people have lived in close relationship with the land since ancient times. This human–land connection can be understood through its geology, history, and culture. Agriculture, forestry, and mining have long supported the local way of life, while religious beliefs and cultural landscapes have developed in harmony with the natural environment. The region is also well known for its hot springs and distinctive food culture. As a geopark, it plays an important role in fostering understanding and pride in the region among both residents and visitors.

At the same time, Nanki Kumano faces major social challenges such as a declining birthrate, an aging population, and depopulation. The region is also located near the Nankai Trough, where the Philippine Sea Plate subducts beneath the Eurasian Plate. Historically, this has brought about massive earthquakes and tsunamis roughly every 100 to 150 years. Preparing for and mitigating such natural disasters is a key function of the geopark.

Geologically, the area is defined by features related to past subduction processes. Situated at the southern tip of the Kii Peninsula, it contains a wide range of geological units: an accretionary prism formed 70 to 20 million years ago, forearc basin sediments from 18 to 15 million years ago, and igneous intrusions dating back around 15 million years. These rocks have undergone ongoing uplifts and erosion, shaping the region's unique mountain, river, and coastal landscapes.

The warm Kuroshio Current, which flows close to the coast, contributes to a mild climate and some of the highest rainfall in Japan, resulting in rich ecosystems both on land and in the sea. The region is dotted with giant rocks, unusual formations, islands, and ancient trees that form distinctive cultural landscapes. Many of these natural features are objects of local worship. Some of the sites are part of the UNESCO World Heritage property "Sacred Sites and Pilgrimage Routes in the Kii Mountain Range."

Through geopark activities, we collaborate with World Heritage sites, Ramsar wetlands, and national parks to promote environmental conservation and education. Our efforts include school based programs, guide training, and workshops for local businesses to rediscover and communicate the value of our geological heritage.

We are also working with universities and research institutions to share the latest scientific findings—such as those from deep-sea drilling projects in the Nankai Trough—with local communities. These outreach efforts help residents understand tectonic mechanisms and disaster preparedness through repeated communication and engagement.

Moving forward, the Nanki Kumano Geopark will continue to deepen and expand these efforts, aiming to join the Global Geoparks Network (GGN) in the near future.

THE GALAPAGOS ISLANDS: A CASE STUDY OF SUSTAINABLE TOURISM IN A PROTECTED AREA

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Keywords: sustainable tourism, protected areas, geoheritage, Galapagos, Latin America

The Galapagos Islands are world renowned as a locality of natural scientific significance and heritage. The islands were designated as a national park in Ecuador in 1959 and later as a UNESCO World Heritage Site in 1978. The Special Galapagos Law (LOREG) was enacted in 1998 to guarantee conservation and sustainable development, and to regulate all human activities such as immigration, and those carried out in protected areas, such as tourism and artisanal fishing. The various regulations, resolutions, ordinances, and other related laws emanating from the LOREG have contributed to maintaining the archipelago's natural state while allowing for the moderate development of productive activities in Galapagos.

The Galapagos Islands are controlled by the Galapagos Governing Council, which regulates who can live and work on the islands, as well as land ownership, business ownership, hotel size, cruise ships, building construction, and the entry of motorized vehicles. The Galapagos National Park (GNP), by mandate of the LOREG, is responsible for the administration and management of all tourism and fishing activities within its territory, which represents 97% of the land surface and 100% of the Galapagos Marine Reserve. There are 176 tourist sites approved by the GNP, both terrestrial and marine, used for tourism, and with focus on geology, ecology, wildlife, and cultural history. Guides licensed by the GNP are issued permits to lead groups on educational tours to a specific subset of visitor sites at a specific time and day. This avoids overcrowding and maintains a limited impact on wildlife and the physical environment.

Since the early 1980's, tourism to Galapagos has increased because travel to the islands has become easier, and accommodation options and tour providers have become increasingly plentiful. More than 320,000 visitors arrived in the islands in 2023. As tourism has increased, opportunities for the residents of the islands have expanded as well, and in turn the population has grown very quickly. As the number of tourist visitors increases each year they are inspired by the pristine and accessible nature and the historic scientific heritage, giving positive societal impacts via the perception by the general public toward conservation of heritage sites. However, the increasing number of visitors creates an added challenge for management of sustainable use of visitor sites. Additionally, there is increasing strain to provide basic services, air and sea transportation, skilled labor, and local investment. To date, sustainable tourism has remained balanced thanks to the existence of the Galapagos Special Regime, which has maintained a balanced decision-making process between the authorities and the local population. This relative success can serve as a model example for current and aspiring Global Geoparks.

PROJECT AND ASPIRING GEOPARKS: SHARED EXPERIENCE BETWEEN HUN BOUN (LAOS) AND MONTS D'ARDECHE (FRANCE)

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Keywords: aUGGp, challenges, experience exchanges, cooperation, community involvement

The Hin Boun Aspiring UNESCO Global Geopark (aUGGp) in central Laos is characterized by diverse and rugged karst landscapes—canyons, plateaus, and deep caves—forming a natural fortress rich in biodiversity and cultural heritage. This territory, home to ancient parietal art, reflects a deep and enduring bond between local communities and their environment, where natural resources remain vital for daily livelihoods.

Since 2009, the Hin Boun region has benefitted from a long-standing cooperation with the Monts d'Ardèche UNESCO Global Geopark and the Ardèche authorities in France, including representatives of the Chauvet Cave (UNESCO World Heritage site). Despite differences in climate, both regions share strong geological, cultural, and spiritual similarities. This partnership has been built on mutual exchange of knowledge in managing natural heritage and promoting sustainable tourism.

The collaboration has produced concrete results: the foundation of responsible tourism practices, the creation of the first ecotourism community association in Laos, greater international recognition of Hin Boun's natural assets, and improved accessibility to exceptional geosites such as Konglor-Natane cave, a 7.5 km subterranean river traveled by boat, connecting the valleys of Konglor and Natane in the heart of the Phou Hin Poun massif and the upcoming Tham Pha Mue which displays hundred of rock art drawings. These milestones have strengthened the ambition of both Lao and French partners to pursue the official designation of the first UNESCO Global Geopark in Laos.

However, several challenges remain. The concept of a geopark is still new and complex for local actors, leading to differing interpretations and expectations. Effective governance requires active and sustained involvement from local communities, whose immediate needs may not always align with long-term geopark objectives. Moreover, ensuring financial sustainability and autonomy for geopark management is critical.

To meet these challenges, the partnership emphasizes peer learning, joint field visits, capacity-building, and communication. Above all, reinforcing the connection between local heritage, community involvement, and institutional support is essential. This cooperation model illustrates how international partnerships can serve as a catalyst for inclusive and sustainable development through the geopark framework.

The shared ambition now is clear: to submit a strong application and secure UNESCO Global Geopark status for Hin Boun—marking a historic first for Laos.

ORANGE ROUTE - A GEOTOURISM INITIATIVE ROOTED IN THE ALGARVENSIS GEOPARK STRATEGY

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Keywords: geotourism, local production, sustainable development, territorial identity, strategic partnerships

The Rota da Laranja (Orange Route) is a geotourism product developed in the framework of the Algarvensis aspiring UNESCO Global Geopark, which encompasses the municipalities of Loulé, Silves, and Albufeira in southern Portugal. This route is a direct output of the Strategic Geotourism Plan of the Geopark, aligning with its mission to promote inclusive, sustainable, and place-based tourism rooted in geological heritage, local identity, and community empowerment. Guided by the principles of slow tourism, the Orange Route responds to contemporary visitor trends by fostering meaningful, sensorial, and low-impact travel experiences. It integrates geodiversity, agroecology, culture, and innovation, turning a product with deep historical roots - the orange - into a symbol of territorial identity and a vector for sustainable development. The unique geological features of the Algarvensis territory, particularly its karstic soils and Mediterranean microclimate, combined with centuries of agricultural know-how and Arab influence, have created ideal conditions for citrus cultivation. These oranges, emblematic of the Barrocal geomorphological unit, are at the heart of this intersectoral initiative, which connects production, transformation, and consumption with tourism, gastronomy, cultural heritage, and education. The Orange Route invites visitors to co-create their own itineraries through an extensive network of local partners. Activities include visits to orchards and nurseries, traditional citrus processing units (juices, jams, liqueurs), tastings of orange-based cuisine, contact with local artisans, and complementary enotourism and heritage stops. This is further enhanced by the Route's trilingual mobile app, which offers augmented reality, thematic pathways, 360º views, and interactive content that deepens interpretation and engagement. This initiative exemplifies the intermunicipal cooperation promoted by the Geopark and supports key Sustainable Development Goals (SDGs), particularly SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 15 (Life on Land). It also materialises the Strategic Partnership Plan of the Geopark, bringing together producers, tourism operators, educators, and municipalities in a shared commitment to the valorisation of endogenous resources. By transforming a traditional economic activity into an integrated geotourism experience, the Orange Route reinforces the Algarvensis Geopark's approach of linking geology, culture, and community in innovative ways that foster territorial cohesion, identity, and resilience.

OPEN-SOURCE GEOSPATIAL TOOLS, PARTICIPATORY MAPPING, PROTECTED AREAS, BIODIVERSITY MONITORING, EARLY-STAGE GEOPARK PLANNING

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Keywords: open-source geospatial tools, participatory mapping, protected areas, biodiversity monitoring, early-stage geopark planning

Cerro Kavaju is a protected area under the category of protected landscape, currently the only protected area directly administered by a departmental government in Paraguay. Geologically, it belongs to the Caacupé Group (Tobatí Formation), composed of friable sandstones from the Ordovician period, shaped into cliffs, rocky outcrops, and terraces. These formations harbor a subhumid semi-deciduous hillside forest, with patches of *cerradón* and rocky communities, creating a highly scenic and ecologically diverse setting. The site also hosts several threatened vertebrate species and one endemic cactus species currently being documented through local fieldwork efforts.

This contribution presents a modular, open-source geospatial platform designed to support the collection, management and publication of biodiversity, environmental and spatial data for areas with the potential to be candidate as a geopark. The platform is being tested at Cerro Kavaju to structure a participatory and technically grounded baseline for site management, communication and future planning.
The system enables the integration of multiple data types, including tabular data, vector layers, raster imagery (e.g., satellite or drone images), and even 3D visualizations derived from elevation models. It also supports species survey records, trail networks, and spatial overlays such as land cover and terrain. The platform offers controlled user access, allowing both public sharing and restricted collaboration between institutions. It also supports the development of digital tools—such as interactive websites—for ecotourism, environmental education, and data dissemination. At the same time, it serves as a channel for providing society with access to relevant datasets for research, outreach, and open data purposes, while ensuring appropriate access levels depending on user profiles.

Preliminary outputs include the use of camera traps for documenting local fauna, trail network mapping with environmental overlays, and the generation of drone imagery and dashboards to communicate results. A native cactus species endemic to Paraguay is currently being monitored through field surveys, including individual counts and biometric measurements (height and diameter), as part of an effort to assess the conservation status of its cliffside population. A 3D reconstruction of the ravine where the population is located is also under development and will be presented through the platform.

By combining accessible digital tools with local engagement, this case illustrates a low-cost, scalable strategy for organizing information and increasing visibility of natural areas that are not yet formally part of international frameworks like the UNESCO Global Geoparks. The approach highlights how open technology can bridge the gap between grassroots conservation and long-term territorial planning.

"ONE GEOSITE, ONE SCHOOL": SUSTAINABLE DEVELOPMENT AND STRENGTHENING COMMUNITIES, THROUGH GEOEDUCATION - MANANTIALES SERRANOS ASPIRING GEOPARK (URUGUAY)

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Keywords: sustainable development, geoeducation, geoconservation, geosites, community involvement

Manantiales Serranos Aspiring UGGp, in its early stages of development, has launched the "One Geosite, One School" Programme, as a strategic initiative for sustainable development, science communication and a vehicle to connect people with their land, to foster community involvement, place-based learning and identity building.

Considering "Geosites" as focus points for launching strategies for sustainable development along the territory, based on their geological, natural and cultural heritage, promoting Geoeducation, Geoconservation and Geotourism, the program links selected Geosites with nearby rural primary educational institutions. Schools become "Geosites guardians," engaging students, teachers, and families in discovering, understanding, and protecting their local heritage. This approach transforms Geosites into educational platforms for interdisciplinary learning, integrating formal education with local knowledge and student-led exploration.

The initiative is deeply participatory: Geosites selection is informed not only by interdisciplinary scientific research but also by social mapping and community input. The program promotes emotional connections with the landscape and a sense of ownership, particularly among youth, empowering them as active agents of geoconservation and sustainable development.

Aligned with SDGs 4, 10 and 17, "One Geosite, One School" contributes to inclusive, quality education while strengthening networks between schools, researchers, local governments and tourism actors. This presentation will share the program's framework, pilot experiences, and lessons learned from the Manantiales Serranos Aspiring Geopark as a case of Geoeducation in action.

TOWARDS THE CONSOLIDATION OF THE MUZQUIZ ASPIRING GEOPARK, COAHUILA, MEXICO

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Keywords: sostenible tourism, geodiversity, paleontology

The Múzquiz Aspiring Geopark is located in the state of Coahuila, in northeastern Mexico, and is part of the Sierra Madre Oriental mountain range, formed by the Laramide Orogeny. Its territory spans semi-desert, mountainous, and riverine areas, covering approximately 8,128 km². It lies at an average altitude of 500 meters above sea level and boasts remarkable geodiversity, represented by Cretaceous sedimentary formations. Múzquiz is situated about 155 km south of Eagle Pass, Texas (USA), the main border crossing point, and 345 km from Monterrey International Airport, which serves as the closest air route for national and international visitors.

Since 2020, efforts have been made to identify, promote, and manage geosites of educational, scenic, and touristic relevance, with the aim of building a proposal aligned with UNESCO guidelines and the Global Geoparks Network.
The initiative was formalized on February 29, 2020, when the geotourism potential of the territory was first presented. Since then, it has had active participation in national and international tourism conventions. Various experiences have been developed focused on the sustainable use of heritage, such as: Water Hiking and Snorkeling, Kayak Expeditions, the Sierra de Santa Rosa Challenge, Magical Múzquiz 3 in 1, and Astro-Historical Hiking, the latter under Class 1 dark skies (Bortle scale).

Highlighted geosites include:
Sabinas River: A Ramsar site and Protected Natural Area with crystal-clear waters, active fluvial processes, and representative riparian biodiversity in the desert.
Sierra de Santa Rosa: Featuring fossiliferous marine outcrops, tectonic structures, and both historical and ongoing mining activity.
Cuesta de Malena, El Pilote, and El Túnel: Examples of landforms associated with erosion, sedimentation, volcanism, and anthropogenic processes linked to the region's extractive history.

The Múzquiz Aspiring Geopark also incorporates key cultural elements, such as the presence of the Negros Mascogos and Kikapú Tribe communities, whose traditional knowledge, artistic expressions, and gastronomy strengthen the biocultural approach.One of its main scientific pillars is its international paleontological significance, thanks to the discovery of exceptionally well-preserved fossils. Among them is the Muzquizopteryx coahuilensis, a Late Cretaceous pterosaur, as well as fossilized fish, crustaceans, and plants— many preserving soft tissues that offer a unique fossil record in North America and provide valuable paleoenvironmental information. The tourism development strategy is structured into tours ranging from one to five days, under the slogan "Xplor Múzquiz and the Magic of the Northern Oasis", focusing on environmental education, community integration, conservation of geological heritage, and the strengthening of local identity..
The Múzquiz Aspiring Geopark has evolved through citizen participation, support from local stakeholders, external advisors, and a clear orientation toward the Sustainable Development Goals. Its multisectoral approach and geoscientific foundation position it as an emerging initiative with high potential for integration into the UNESCO Global Geoparks Network.

PATAGONIA VERDE GEOPARK PROJECT: TOWARDS ITS RECOGNITION AS A UNESCO GLOBAL GEOPARK

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Keywords: Patagonia Verde Geopark project, geodiversity, geoconservation, territorial development, governance

Patagonia Verde is a territory located in the Southern Andes of Chile, encompassing the municipalities of Cochamo, Hualaihue, Chaiten, Futaleufu, and Palena of Los Lagos Region. Its geodiversity is related to volcanic, tectonic, glacial, and sedimentary processes occurred during the last 400 million years. Ninety-one sites of geological interest have been identified, at leastm 14 of which exhibit attributes of international significance. Notable features include active volcanoes, fjords, hot springs, glaciers, rivers, and frequent mass-movement events.

Approximately 50% of the territory corresponds to natural protected areas and it is partially included within the UNESCO Temperate Rainforest Biosphere Reserve of the Southern Andes, which demonstrates its international ecological value. It is also part of the Natural Laboratory Southern Andes of Chile (mountain category), a national initiative promoted by the Ministry of Science of Chile to bring scientific knowledge closer to communities inhabiting areas with unique attributes for research.

Since 2015, numerous initiatives have been undertaken by universities, together with public and privet institutions, to promote culture, tourism, and local development in Patagonia Verde. The present challenge is to consolidate these efforts into an integral territorial development strategy through the UNESCO Global Geoparks framework, integrating conservation, education, and the sustainable economic use of geological heritage. Several identified geosites already have interpretation panels, touristic trails, and active conservation actions. The initiative is promoted initially by the Association of Local Guides of Patagonia Verde, the Austral University of Chile, and the Foundation for the Sustainable Development of Patagonia Verde, which have coordinated their efforts with public agencies and local stakeholders. In this context, the initiative seeks to expand its collaboration network with other relevant public and private institutions, strengthening participatory governance and establishing an integrated territorial management model.

This contribution presents the progress achieved to date and proposes guidelines to consolidate the Patagonia Verde Geopark project as an effective tool for sustainable territorial development, the valorization of natural and cultural heritage, and the articulation of synergies between communities, scientific institutions, and the private and public organizations.

RIVERS OF MEMORY, LANDS OF STONE: THE SRÃO'S JOURNEY TOWARD GEOPARK RECOGNITION (NE BRAZIL)

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Keywords: local empowerment, policy frameworks, geo-cultural assets, sustainable tourism models, stakeholder collaboration

In recent decades, UNESCO Global Geoparks (UGGps) have emerged as innovative platforms for integrating geoconservation, sustainable tourism, and community development. As the world grapples with environmental challenges and seeks inclusive development strategies, UGGps offer a unique model that blends natural heritage with cultural identity, education, and economic opportunity. Within this global movement, Iran holds significant untapped potential. Home to exceptional geo-cultural landscapes—from the Lut Desert to the Zagros Mountains—Iran was an early regional pioneer in UGGps initiatives. Nevertheless, despite identifying over thirty promising sites since 2000, only three—Qeshm Island, Aras, and Tabas—have achieved official UNESCO designation. This disconnect between potential and implementation underscores a need for strategic realignment.

This study examines the fundamental factors that have limited the development of Iran's UGGp and investigates how a more cohesive and context-aware approach can harness the country's extensive geoheritage potential. Utilizing a five-phase, mixed-methods framework, the research commences with a historical overview of Iran's UGGps initiatives and a comparative evaluation of international best practices. Subsequently, it identifies and assesses significant geo-cultural sites for their suitability, utilizing geospatial data and field observations. By conducting in-depth case studies of Iran's current UGGps, the research evaluates their effects on conservation, education, and socio-economic resilience. Surveys of stakeholders and policy analysis reveal institutional and operational challenges, culminating in the creation of a strategic roadmap informed by SWOT analysis and insights from successful global examples.

In this context, this research seeks to elucidate how political, environmental, and economic factors influence the implementation of UGGps in Iran, as well as how these obstacles can be addressed through enhanced policy, strategic planning, and community involvement.

Anticipated results encompass a national GIS-based catalogue for UGGps locations, a pragmatic policy framework aimed at expanding the UGGp network, and actionable strategies to enhance funding, inter-agency collaboration, and grassroots engagement.
By integrating theoretical insights with practical applications, this study aspires not only to guide national policy but also to motivate a wider regional transition towards inclusive and sustainable heritage management. It positions Iran to take a leading role in re-envisioning UGGps as transformative environments, where geological features intersect with human communities, and local populations assume the role of guardians of a legacy of global significance.

RIVERS OF MEMORY, LANDS OF STONE: THE SRÃO'S JOURNEY TOWARD GEOPARK RECOGNITION (NE BRAZIL)

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Keywords: Pajeú backlands, lower middle São Francisco, geopark project, brazilian Sertão

The Brazilian Northeast is a region marked by remarkable geodiversity, reflecting not only the Earth's evolutionary history but also a rich tapestry of cultural, historical, and socio-environmental values. This work explores the potential of two territories Sertão do Pajeú and Sertão do São Francisco as future UNESCO Global Geopark projects. Both areas, located in Bahia and Pernambuco States, offer outstanding examples of geoscientific heritage, community identity, and sustainable development opportunities.

The Sertão do Pajeú bears witness to Brazil's ancient orogenic processes, with geological formations dating back 850–630 million years. Its landscape includes the Borborema Belt and Pernambuco's shear zones, punctuated by geosites such as Pico do Papagaio, the Pernambuco state's highest point and a natural geological observatory. Meanwhile, the Sertão do São Francisco within the Borborema Province also records this deep-time evolution linked to the Pan-African/Brasiliano Orogeny and the assembly of Gondwana. Its geological framework includes the São Francisco Craton, the Borborema Fold Belt, and Quaternary floodplain deposits along the São Francisco River. Beyond their geological significance, these territories are cultural landscapes shaped by centuries of human interaction. Indigenous peoples, quilombolas, riverine and artisanal communities all contribute traditional ecological knowledge, arts, cuisine, and spiritual practices that form the living heritage of the region. These human-nature connections are poetically encapsulated in the music of Luiz Gonzaga, whose songs evoke the centrality of rivers like the Pajeú and São Francisco as symbols of life, memory, and resilience in the semi-arid Sertão. Recognizing these areas as potential UNESCO Global Geoparks would elevate not only their scientific relevance but also their cultural depth, affirming them as territories of identity, education, and inclusive, sustainable development. This dual valuation of geology and living culture positions the Sertão do Pajeú and Sertão do São Francisco as emblematic landscapes of Brazil's semi-arid Northeast.

ALGARVENSIS GEOPARK ASPIRING UNESCO GLOBAL GEOPARK: WHERE DEEP TIME SHAPES A LIVING TERRITORY

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Keywords: geoeducation, geoconservation, sustainability, community engagement, strategic partnerships

Located in southern Portugal, the Algarvensis Aspiring UNESCO Global Geopark (aUGGp) covers a territory of 2,427 km², encompassing 1,584 km² of inland area and 843 km² of marine and coastal environments. It spans three municipalities, Loulé, Silves, and Albufeira, and includes 19 parishes, with a population of approximately 177,631 inhabitants (2021). This Geopark proposal showcases the deep interconnection between geology, culture, biodiversity, and community identity in a region shaped by exceptional natural and cultural diversity. The Algarvensis aUGGp features 41 inventoried geosites, of which six (14.6%) are recognised for their international significance: the Penina Fossil Site, where the unique species *Metoposaurus algarvensis* was discovered; the Loulé Salt Mine, with palynological evidence marking the Triassic–Jurassic boundary; the coastal geosite of Arrifes, exemplifying marine abrasion platforms; the CAMP outcrops, representing magmatic activity linked to the breakup of Pangea; the tsunamite deposit, preserving sedimentary records of the 1755 earthquake-induced tsunami; and the Pirinéu site, with notable stratigraphic sequences. These sites offer critical insights into deep-time processes, mass extinctions, and geohazards. Together, they serve as a living laboratory for research, education, and geotourism, functioning as outdoor classrooms and storytelling platforms that foster public understanding and local pride.

The Algarvensis aUGGp is a coastal Geopark shaped by dynamic natural forces and human resilience. Its educational strategy prioritizes climate action and disaster risk reduction, making the territory a true open-air classroom. Flagship initiatives such as “The Geopark is My School” empower students and teachers to explore the territory through place-based, interdisciplinary learning rooted in sustainability and local heritage. The Geopark is also a

platform for partnerships, actively engaging municipalities, schools, universities, cultural institutions, NGOs, and local businesses.

This collaborative approach is further reinforced through networking with all six Portuguese UNESCO Global Geoparks, fostering joint actions in education, communication, and science. At the international level, Algarvensis maintains a cooperation protocol with the M'Goun UNESCO Global Geopark (Morocco), enabling staff exchanges and mutual learning. In parallel, the ongoing collaboration with Cliffs of Fundy UGGp (Canada) through the "Reunite Pangea" initiative creatively reconnects ancient geologies through joint artistic, scientific, and educational actions involving youth and local communities. Through an inclusive, bottom-up approach, Algarvensis aspires to be more than a label. It seeks to be a platform for co-creation, where rural and urban voices converge, and where geology becomes a tool to understand the present and shape a more sustainable future. Fully aligned with the 2030 Agenda, the Geopark contributes to several Sustainable Development Goals, including education (SDG 4), gender equality (SDG 5), sustainable tourism (SDG 8), inclusive communities (SDG 11), climate action (SDG 13), and the protection of life on land and sea (SDGs 14 and 15), through integrated, community-based, and science-driven approaches.

GEOCOMMUNITY PARTICIPATION IN THE ASPIRING UNESCO GLOBAL GEOPARK, MALAYSIA

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Lenggong UNESCO Global Geopark, MALAYSIA.

Keywords: geotourism development, indigenous knowledge integration, sustainable heritage conservation

The Lenggong Valley, recognized as a UNESCO World Heritage Site in 2012 for its exceptional archaeological heritage, is currently aspiring towards designation as a UNESCO Global Geopark (UGGp). Situated in Perak, Malaysia, the Lenggong Geopark initiative integrates geoconservation, heritage preservation, sustainable resource management, and geotourism development with active community engagement at its core. The Aspiring Lenggong UNESCO Global Geopark in Malaysia integrates geoconservation, heritage preservation, and sustainable development through active **Geocommunity Committee** participation. By empowering local stakeholders via education, geoproduct innovation, indigenous engagement, and strategic partnerships, the initiative promotes geotourism, safeguards cultural heritage, and enhances socio-economic resilience while preserving Lenggong's unique geological legacy.

The Geocommunity Committee operates across multiple clusters, including education, tourism and accommodation, small and medium enterprises (SMEs), indigenous communities, youth engagement, and environmental stewardship. Through regular workshops, town hall sessions, and strategic planning, the committee empowers local stakeholders by promoting sustainable livelihoods while reinforcing stewardship of geosites. Initiatives such as the establishment of the **Lenggong Geopark Cooperative**, development of geoproducts (geofood, geocrafts, and local tourism packages), and capacity-building programs have enhanced community participation in the geopark's development and contributed significantly to the local economy.

A key aspect of this initiative is the integration of **education and knowledge transfer**. The **Geopark School Module**, jointly developed by the Department of Mineral and Geoscience Malaysia (JMG) and Universiti Kebangsaan Malaysia (UKM), serves as a structured educational tool to instill geoscience awareness among primary school students. Complemented by "Training of Trainers" (ToT) programs, local educators are equipped to deliver lifelong learning opportunities that foster environmental stewardship and appreciation of Lenggong's geological and archaeological significance.

Furthermore, the involvement of **indigenous communities**, particularly the Lanoh and Temiar Orang Asli groups, underscores the inclusive nature of this initiative. Collaborations with the Department of Orang Asli Development (JAKOA) and non-governmental organizations such as the Bambusa Foundation have facilitated the integration of indigenous knowledge, culture, and traditions into ecotourism and geocraft production, promoting cultural sustainability alongside economic resilience.

Partnerships form another cornerstone of the Lenggong Geopark's strategy. Through multisectoral collaborations with more than 15 key partners — including government departments, NGOs, cooperatives, and private stakeholders — the aspiring geopark has implemented diverse programs that blend heritage conservation with sustainable tourism. These partnerships have catalyzed progress toward socioeconomic upliftment and reinforced Lenggong's identity as a living landscape "Where The Earth's and Human History Intertwine."

As the Lenggong Valley advances toward its UNESCO Global Geopark status, the geocommunity-driven approach illustrates how integrating education, conservation, and community empowerment can collectively safeguard heritage while driving sustainable regional development. The ongoing journey offers a replicable model for other aspiring geoparks seeking to balance heritage preservation with local economic growth.

SUGGESTION OF NEW PARADIGM FOR UNESCO GLOBAL GEOPARKS

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Keywords: UNESCO Global Geoparks, geological heritages, geological significance

UNESCO Global Geoparks encourage international cooperation between areas with geological heritage of international value, through a bottom-up approach to conservation, local community support, promotion of heritage and sustainable development of the area.

The original Geopark concept arose in the mid-1990s as a response to the need to conserve and enhance the values of geological significant sites in Earth history.

Global Geoparks consist of geological heritages, where science and local communities engage in a mutually beneficial way especially in remoted and low-developed areas. Education at all levels is also at the core of the Global Geopark concept. Geomorphic features and geological formations are key witnesses to the evolution of our planet Earth and cornerstones for our future sustainable development. From the beginning, Geoparks adopted a “bottom-up” or community-led approach to ensure that an area’s geological significance could be conserved and promoted for science, education and culture, in addition to being used as a sustainable economic growth for indigenous people such as through the development of responsible geotourism.

From now on, UNESCO Global Geoparks should change their paradigms, and actively widen their scopes upto some metropolitan area to carry out new goals in addition to economic benefit for local inhabitants. In partnership with big city communities, metropolitan Geoparks will particularly provide wide ranges of chances for education to young generations and can maximize popularization of geosciences to regional public nearby mega cities.

SHOWCASING A TERRITORY: STRATEGIES FOR ENHANCING GEOPARK VALUE DURING THE UNESCO EVALUATION MISSION, EXAMPLES OF THE GEOPARK TERRES D'HERAUL

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Keywords: aspiring geopark, evaluation mission, territorial valorisation, geopark narrative, stakeholder engagement

The Terres d'Hérault aspiring UNESCO Global Geopark is located in southern France, in the Occitanie region. It spans over 2,046 km² and brings together 111 municipalities around a rich and diverse geological heritage covering 540 million years of Earth history. The territory combines emblematic geosites, vibrant cultural practices, and a strong commitment to sustainable territorial development, supported by local institutions, scientific partners, and communities.

In 2025, the territory had hosted the UNESCO evaluation mission, from June 23 to June 27. This visit represents a pivotal and demanding moment in the life of any aspiring Geopark. Beyond the technical aspects of verifying compliance with the criteria, the evaluation visit is also a rare opportunity to showcase the full potential of a territory: its geological identity, the strength of local engagement, and the relevance of its development strategies.

This presentation explores how to design and organize such a visit not merely as an inspection, but as a coherent and engaging narrative journey through the Geopark. Drawing on the practical experience of the Terres d'Hérault team, we will present a methodology for creating a meaningful itinerary that highlights the territory's values, encourages authentic encounters with stakeholders, and fosters both scientific understanding and emotional connection to the landscape.

We will discuss key elements of this approach, including the strategic sequencing of visits, the role of interpretation tools, the integration of local food and traditions, and the balance between authenticity and thoughtful curation. Particular attention will be given to how we addressed logistical constraints while ensuring a fluid, memorable experience that reflects the territorial project as a whole.

This contribution is shared with no pretension to offer a model, but rather in a spirit of openness and humility. By reflecting on our preparation process, including successes, doubts, and adjustments, we hope to support and inspire other territories preparing for their own evaluation missions. Ultimately, we believe that the evaluation visit can become much more than a final step: it can be a catalyst for internal cohesion, external recognition, and the long-term empowerment of a Geopark community.

DEVELOPING AN ASPIRING UNESCO GLOBAL GEOPARK IN SOUTHERN MONGOLIA: GEOLOGICAL HERITAGE, CULTURAL LEGACY AND SUSTAINABLE POTENTIAL

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Keywords: geopark development, southern mongolia, geodiversity, paleontology, cultural heritage

This abstract outlines a comprehensive feasibility study conducted in 2024 supporting the nomination of a cross-provincial geopark area spanning Ömnögovi and Dornogovi aimags (provinces) of Southern Mongolia into the UNESCO Global Geoparks Network. The proposed area includes the territories of Khanbogd and Manlai soums (Ömnögovi), and Khatanbulag and Mandakh soums (Dornogovi), which together represent a unique integration of geological, paleontological, and cultural heritage.

Geologically, the site encompasses Paleozoic volcanic and sedimentary sequences, extensive Mesozoic fossiliferous formations, and notable intrusive rock bodies such as the alkaline granites of the Khanbogd massif. Fossil-rich localities such as Shar Tsav, Bayshin Tsav, and Amtgai are internationally recognized for their well-preserved hadrosaurid, theropod, and turtle fossils. These discoveries contribute significantly to global understanding of Late Cretaceous ecosystems and dinosaur evolution in Central Asia.

Complementing the natural heritage are outstanding cultural and spiritual sites, including ancient monasteries, petroglyph complexes, Paleolithic cave burials (e.g., Gurvan Zeerdiin Cave), and archaeological features dating back to the Bronze Age. The area is also rich in intangible heritage, including traditional camel culture, Gobi urtiin duu (long song), and desert culinary traditions. Community-based consultations emphasized strong local support for the proposed aspiring geopark and recognition of its potential to generate sustainable development opportunities through geotourism, education, and cultural preservation.

The multidisciplinary research team conducted a suitability assessment using UNESCO's criteria, covering geomorphology, biodiversity, climate, archaeological distribution, and heritage management practices. Special emphasis was placed on risk management, stakeholder engagement, and the alignment of institutional responsibilities with international conservation standards.

Our findings suggest that the area has high potential to fulfill the requirements for inscription as a UNESCO Global Geopark. Ongoing work includes finalizing the management structure, implementing interpretation strategies, and expanding geo-education initiatives. This nomination would mark a significant milestone for Mongolia in the sustainable use and conservation of its geological and cultural resources.

TASTING TERRITORY AND IDENTITY: A GEOTOURISM EXPERIENCE FROM COAST TO INLAND IN THE ALGARVENSIS GEOPARK

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Keywords: geotourism, local identity, partnerships, slow tourism, SDGs

The aspiring Algarvensis UNESCO Global Geopark (aUGGp), located in southern Portugal, encompasses the municipalities of Loulé, Silves and Albufeira. It promotes innovative and inclusive partnerships that connect the diversity of its territory, from the coast to the barrocal and the uplands, through meaningful and co-created initiatives. A good example of this approach was the event jointly organised with two official partners: AlgarExperience, a maritime tourism operator based in Albufeira, and the Cooperative of the Alte Vocational School, located in the barrocal area of the municipality of Loulé. This initiative consisted of a guided maritime tour along the coastal stretch of the Geopark, onboard one of AlgarExperience's vessels. The experience was designed to go beyond sightseeing, creating a platform to showcase the cultural and gastronomic richness of the interior. Onboard, a professional chef, explicitly contracted for the event, prepared and served traditional dishes using products cultivated and produced in the Geopark territory, notably by the cooperative of the Alte Vocational School. This allowed for a symbolic and practical connection between the productive landscapes of the barrocal and the maritime identity of the coastal area, exemplifying the Geopark's mission to link and valorise its three distinct geomorphological units: the serra (mountain range), the barrocal (karst transition zone), and the coastal zone, through strategic, place-based actions. To broaden territorial inclusion and representation, the event also featured a pre-boarding showcase with the participation of an artisan from another part of the Geopark, located in the municipality of Silves. This ensured that local artisans from across the three municipalities were actively engaged, not only those based in Albufeira, reinforcing the Geopark's commitment to equity, diversity and intermunicipal cohesion. This action reflects the operationalisation of the Algarvensis aUGGp's Strategic Partnership Plan by combining local production, tourism innovation, and cultural promotion in a collaborative and inclusive model. The initiative contributes directly to several Sustainable Development Goals (SDGs), particularly: SDG 12 - Responsible Consumption and Production, through the use of seasonal, local products; SDG 17 - Partnerships for the Goals, by co-developing the initiative with private, educational and cultural stakeholders. This good practice illustrates how the Geopark acts as a facilitator of cross-sector and cross-territory collaboration, using tourism as a tool for both sustainability and territorial cohesion. It also highlights the value of partnerships in enhancing local identity and fostering community-driven development, reinforcing the transformative role that Geoparks can play in rural innovation and cultural resilience.

POTENTIAL GEOPARKS AND CULTURAL HERITAGE SITES, SUSTAINABLE LOCAL DEVELOPMENT, AND GEOTOURISM ALONG THE COASTAL AREAS OF BALONCHISTAN, PAKISTAN

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Keywords: Balochistan Coastal Geoparks, Sustainable Development in Makran Region, Colonial Heritage Conservation in Gwadar and Pasni, Mud Volcanoes and Tectonic Landscapes of Balochistan

The coastal belt of Balochistan, stretching along the Arabian Sea in southwestern Pakistan, is a region of exceptional geological, ecological, and cultural significance. Rich in diverse geosites, including unique mountain formations, mud volcanoes, and pristine islands, this area holds immense potential for the development of geoparks, which can drive sustainable local development and promote geotourism. This paper explores the interplay between the natural geological heritage and historical coastal architecture of Balochistan, highlighting how geoparks and heritage-based tourism can contribute to community resilience and economic upliftment.
Among the most iconic geological features is Hingol National Park, the largest in Pakistan, known for its spectacular rock formations and the *Princess of Hope* a wind-carved figure that stands as a symbol of the region's natural artistry. The park also contains *active mud volcanoes*, among the few of their kind globally, offering insights into Earth's subsurface dynamics. Nearby, the Passo village, Pishukan-like mountain formations in the Makran coastal range resemble stratified sedimentary outcrops, narrating the region's tectonic history shaped by the collision of the Indian and Eurasian plates. Offshore, *Astola Island*—also known as Haft Talar is Pakistan's largest island and a biodiversity hotspot. With its sedimentary formations and coral reefs, the island presents opportunities for eco-geotourism while emphasizing the need for conservation-led management. In addition to its geodiversity, Balochistan's coastal heritage includes centuries-old buildings and forts from the *British, Omani*, and Portuguese eras, especially in towns such as Gwadar, Pasni, and Ormara. These include Omani-era barracks, colonial warehouses, forts, and religious structures that once served as trade, defense, and administrative hubs during historical maritime interactions across the Arabian Sea. The fort at Gwadar, constructed during Omani rule, and *Portuguese-influenced architecture* in Makran, are testaments to the region's multicultural maritime legacy. Recent efforts to rehabilitate and conserve these historical buildings under heritage preservation programs have begun to gain momentum by Gwadar Development Authority (GDA) government of Balochistan. The adaptive reuse of these structures as museums, cultural centers, or geotourism sites not only preserves architectural heritage but also provides new income-generating opportunities for local communities. When integrated with geopark planning, these cultural assets can greatly enhance the tourism value chain by offering visitors a holistic experience that combines geology, history, and local culture. The establishment of UNESCO-style geoparks in Balochistan offers a practical model for sustainable local development. Geotourism rooted in conservation, education, and community participation can create employment in areas such as ecotourism services, craft production, heritage guiding, and eco-lodging. These efforts promote climate-conscious development and help revitalize marginalized coastal communities. Nevertheless, the success of such initiatives hinges on inclusive governance, infrastructure investment, and capacity-building at the grassroots level. Strategic partnerships between provincial authorities, local stakeholders, academic institutions, and international organizations are essential for effective implementation. This study advocates for recognizing and protecting Balochistan's geological and cultural heritage as a foundation for sustainable development, proposing geoparks as transformative tools for economic diversification, environmental stewardship, and cultural preservation in Pakistan's coastal regions. The methods will be oral presentation.

PILLANMAPU: BUILDING A UNESCO GLOBAL GEOPARK IN THE ANDES OF CENTRAL CHILE – JOURNEY, CHALLENGES AND LESSONS LEARNED

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Keywords: aspiring geoparks, geopark development, geopark management.

The Pillanmapu Geopark project, located in the Andes of Chile's Maule Region, is a citizen-led initiative launched in 2019 to establish a UNESCO Global Geopark in one of the country's most geodiverse and culturally rich mountain landscapes. Initially spanning six municipalities, the project refocused in 2024 to concentrate on the commune of San Clemente, home to the territory's most emblematic geosites and strongest local engagement.

Over six years, Pillanmapu has built a model grounded in five core pillars: research, education, geotourism, conservation, and governance. Backed by over $260,000 USD in public funding, the team has produced the first comprehensive inventory of the region's heritage, designed a 10-year MasterPlan, launched a documentary series, created *Clima y Crisis*, an interpretive exhibition hall on climate change and disaster risk (funded by the Ministry of Science), and implemented specialized training programs for local guides. These milestones, alongside public courses, excursions, and participatory events, have helped foster territorial identity and stewardship in collaboration with communities, universities, and public institutions.

Strong alliances have been key to Pillanmapu's progress. The project has built formal partnerships with the Regional Government, the Municipality of San Clemente, the Regional Corporation for Productive Development (CRDP), the Catholic University of Maule (UCM), and regional offices of the Ministries of National Assets, Environment, and Public Works. Equally vital has been the involvement of local stakeholders: tourism operators, guides, neighborhood councils, and tourism chambers. This broad-based approach has anchored the initiative in both scientific rigor and community aspirations. In June 2025, the Regional Government and the Municipality jointly submitted the Letter of Intent to UNESCO, affirming their commitment to lead the future governance and long-term management of the Geopark.

This presentation will trace Pillanmapu's evolution—from grassroots vision to near-candidate status—highlighting the decisions, challenges, and lessons learned in developing a geopark rooted in identity, collaboration, and resilience.

NATIONAL GEOPARKS COMMITTEE: TOWARDS THE DEVELOPMENT OF GEOPARKS IN URUGUAY

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Keywords: Project and Aspiring Geoparks, National Geoparks Committee, Uruguay

The incorporation of Grutas del Palacio Geopark into the Global Geoparks Network in 2013 has sparked growing interest in the knowledge and conservation of Uruguay's geological heritage. The successful experience of the geopark, with two revalidations in ten years (actually is running the third one), has encouraged other actors and local governments to take action to develop other proposals to be presented to the global network. The need for institutional support and for a national commission to encourage, advice, and accompany new projects opened up the prospect of creating the National Geoparks Committee in 2016. This committee includes representatives from the ministries of Education and Culture, Tourism, Environment, and Mining, as well as from the Congress of Mayors and the University of the Republic. Its tasks include, among others, surveying geological heritage, promoting its value and conservation; implementing management actions for UNESCO Global Geoparks in Uruguay; and promoting the creation and development of new geoparks in the country. There are currently one aspiring and two geopark projects, at different stages of development, in different regions of the country: the Botucatú Mining Geopark in the north, the aspiring Manantiales Serranos Geopark in the southeast, and the Cerro Largo Geopark in the northeast, the latter two having been evaluated by the committee in the last year. Recently, the national committee accompanied the Evaluation Mission to the Manantiales Serranos Aspiring Geopark for its first validation, and to Grutas del Palacio UNESCO Global Geopark for its third revalidation. The process of creating the national committee—the first in Latin America—has made it a benchmark for its inter-institutional coordination role, bringing together different political representatives and technical experts to promote the conservation of geological heritage and support the creation of new geoparks. Perhaps the Uruguayan model of a national committee could serve as an example or promote similar initiatives in other countries in Latin America and the Caribbean.

CONSERVATION, SCIENCE AND RESEARCH IN GEOPARKS



TWO-DIMENSIONAL MODELS TO EXPLAIN THE VOLCANIC ORIGIN OF GEOLOGICAL HERITAGE AND WATER SOURCES IN THE COMARCA MINERA GEOPARK, MEXICO

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Keywords: volcanic origin, volcanic activity, geological heritage, drainage basin, aquifers

The Comarca Minera Geopark is situated in the State of Hidalgo and spans nine municipalities across an area of approximately 1,900 km². Each municipality holds 2 to 5 geosites, which may be of geological, natural, historical, scientific, academic, or cultural interest.

Two interactive models are presented: one illustrating a volcano, and the other a drainage basin. The volcano model is used to explain, raise awareness, and educate the general public about the different types of volcanic activity that occur in an active volcano and their relation to the origin of the geological, mining, and thermal water heritage found in the Comarca Minera Geopark. The technical part of the model simulates fumaroles and seismic tremors, effusive volcanic activity with lava flows, and dome formation. Explosive activity occurs in the form of phreatic and phreatomagmatic eruptions, dome collapse, plinian eruptions with the formation of an eruptive column, and the formation of pyroclastic flows and lahars. At the end of the presentation, the origin of thermal waters and mineral deposits is explained, as well as their relationship with the magmatic activity in the region. The audience is invited to identify volcanic hazard zones through ash deposits, lava flows, pyroclastic deposits, and lahar deposits.

The drainage basin model is used to explain, raise awareness, and provide training on the origin of water, its care, and protection.

Water Cycle. Precipitation, filtration, runoff, evaporation, and cloud formation are presented.

Aquifer and Spring Recharge. The importance of forests and vegetated areas is emphasized, as they promote the filtration of water that recharges springs and aquifers. It is also shown that logging increases runoff, erosion, flooding, and mass removal phenomena, while decreasing the recharge of aquifers and springs.

Aquifer contamination caused by garbage dumps. It is demonstrated how a landfill or garbage dump, through its leachate, can contaminate groundwater.
Formation of sinkhole and dissolution caves. It is shown how the dissolution of carbonate rocks leads to the formation of sinkholes, caves, stalactites, and stalagmites, as well as underground rivers.

These two interactive models are taken to schools, communities, municipal public squares, and tourist centers. Both are accompanied by activities, coloring sheets, puzzles, videos, and games to raise awareness and promote the care and conservation of water, the environment, and the geological heritage in the Comarca Minera Geopark.

SALIR TRACKSITE: THE ROLE OF OESTE UNESCO GLOBAL GEOPARK (PORTUGAL) IN A GEOCONSERVATION PROJECT

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Keywords: geoconservation, science and research in geoparks

In the Oeste UNESCO Global Geopark (Oeste UGGp), Jurassic rocks represent 77% of the total area, known for many dinosaur discoveries. These findings include dinosaur bones, eggs, footprints, coprolites, and gastroliths, as well as fossils of other Jurassic organisms.

Within the scope of the activity of a UGGp, particularly in terms of geoconservation, several initiatives can be developed directly or indirectly by the geopark's technical teams. The Oeste UGGp has been working closely with municipalities, local research organisations (namely the Museum of Lourinhã and the Natural History Society of Torres Vedras) and local communities, for several years. A major outcome of this cooperative work is the preservation of palaeontological findings. Under this scope, a geoconservation proposal was designed and presented by Oeste UGGp to the Municipality of Caldas da Rainha, aiming for the preservation of the Salir geosite, known for its palaeontological heritage (footprints, bones and bivalve and gastropod shells).
The objective of this proposal was to start a comprehensive geoconservation project, aiming to stimulate new scientific research and identify new palaeontological materials, while simultaneously involving local communities in palaeontological field work.

The first campaign took place this year, in three weeks. A coastal limestone slab with nearly 23 000 m^2 was cleaned, liaising with all the players involved, as well as a group of 20 volunteers. The palaeontological research organisations were responsible for the excavation work, the Municipality of Caldas da Rainha financed the operation and the Civil Parishes of Tornada and Salir do Porto guaranteed operational support. As a result, new fossils were identified, both bones and footprints, but an area of over 11 000 m^2 still requires cleaning and further analyses, having the potential to provide more findings.

This project is a clear example of the role of a UGGp, by serving as an aggregating and transforming platform in the territory. In this case, without the initiative of the Oeste UGGp, this project would never have taken place in a collaborative way, by involving regional/local organisations, and maximizing its impact, recognition and appreciation by local communities.

The Oeste UGGp will continue to coordinate further campaigns at this geosite and will propose the installation of infrastructures that allow for more comfortable and safer visits, along with information panels aiming to increase literacy on this matter and allow for independent interpretation of ichnofossils by visitors.

CONSERVATION OF PALEONTOLOGICAL FOSSIL RESOURCES IN TIANZHUSHAN UNESCO GLOBAL GEOPARK

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The Qianshan Basin is located in Anqing City, southwestern Anhui Province, and is part of the eastern area of Tianzhushan UNESCO Global Geopark. Geotectonically, it occupies a unique position at the composite junction of the eastern segment of the Dabie Mountain collisional orogenic belt (between the North China and Yangtze paleoplates) and the Tan-Lu Fault Zone. A set of Late Cretaceous-Paleocene fluvial-lacustrine red clastic sedimentary rocks has been deposited within the basin, providing superior geological conditions for the preservation of paleontological fossils. The Paleocene vertebrate fossils yielded by this basin are not only enormous in quantity but also extremely rich in types, covering three major categories—reptiles, birds, and mammals—totaling 48 genera and 64 species (including 9 undetermined species). They also feature distinct regional characteristics: key fossils such as *Heomys orientalis* and *Mimotona wana* are the ancestral forms of rodents and lagomorphs respectively, holding an irreplaceable position in global paleontological evolution research. Meanwhile, the fossils are relatively concentrated in distribution, mainly occurring in the Paleocene Wanghudun Formation and Doumu Formation, and boast prominent scientific research value. They provide precious physical evidence for exploring major scientific issues such as the evolution of mammals in the early Cenozoic, paleobiogeography, and changes in paleoecological environments, making the Qianshan Basin an important global base for studying Paleocene vertebrate evolution. Since Tianzhushan UNESCO Global Geopark incorporated this fossil site into its management in 2011, and Qianshan was recognized as a national key protected paleontological fossil site in 2017, a protection project with a total investment of 79.08 million yuan has been implemented since 2013. The project advances five major initiatives: resource survey (identifying 15 key fossil sites), site protection (cleaning, boundary demarcation, and installation of signs and fences), specimen protection (rescue excavation and establishment of a collection database), science popularization (compiling books and organizing field investigation activities), and development & utilization (creating fossil restoration models and mascots). These efforts have effectively protected the fossil resources and achieved remarkable results in scientific research, popular science, and sustainable utilization.

PROTECTING AND SHARING THE MEMORY OF THE EARTH IN THE NORMANDIE-MAINE UNESCO GLOBAL GEOPARK

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Keywords: conservation, reserve, geodiversity, biodiversity

Enhancing the connection to nature to protect and reclaim biodiversity is one of the ambitions of the territorial project led by the Normandie-Maine Regional Natural Park and UNESCO Global Geopark by 2040. One of the measures defined to work towards achieving this ambition is to protect and share the memory of the Earth.

Within the Normandie-Maine Geopark, the observable geological diversity makes it possible to retrace nearly 600 million years of history, to shed new light on natural and cultural heritage, and to understand the history of human settlement in the territory.

The Park and Geopark's commitment to preserving and promoting this heritage began in the 1990s and was strengthened in 2007 by its contribution to the National Inventory of Geological Heritage. The Park and Geopark became a pioneer in this area, notably through the creation of a dedicated mission in 2009, which led, among other things, over the years to the creation of two multi-site Geological Regional Natural Reserves and another classic Regional Natural Reserve housing geological heritage.

The continued identification and preservation of this geological heritage is a major challenge for the Park and the Geopark. Geological sites with high heritage value must be subject to strong protection measures, whether through their classification as a Regional Natural Reserve or through the adoption of Prefectural Geotope Protection Orders.

Thanks to the protection and regulatory management tool that is the Regional Natural Reserves, the Park and the Geopark demonstrate that, although this tool was initially created to preserve biodiversity and natural heritage more generally, it becomes possible to highlight the close relationships between the geological heritage and all the other natural and cultural components of the territories within these protected areas.

At the heart of these reserves, particular attention is paid to the intrinsic links uniting geodiversity and biodiversity, particularly within the heritage and emblematic natural environments of the Park and the Geopark such as plain scree, peat bogs, rocky outcrops, moors, etc. The creation of a third multi-site Geological Regional Natural Reserve to the south of the Normandie-Maine Park and Geopark aims, in addition to preserving, managing and promoting the geological heritage, to show that geodiversity is indeed the silent partner of biodiversity, and that the two are inseparable.

GEODIVERSITY AND GEOCONSERVATION IN THE ISLAND OF CRETE, GREECE

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Keywords: geosite inventory, geodiversity, geoconservation, Crete

Greece was built during the late phases of Alpine orogenesis hosting thus a great geodiversity. At its southern part is located the island of Crete representing the late stages of the orogenetic activity, still shaped and transformed over the Hellenic subduction zone. Formed as an accretionary prism in late Neogene times, it experienced a rapid uplift the Quaternary. As a result, a large number of nappes appear stacked one over the other, deformed by neotectonic extensional deformation that separated the highland areas from the basins, where more recent sediments were deposited. Intense deformation and syntectonic erosion shaped the island with a great variety of landforms including deep gorges, small and large plateaus, tectonic basins, deep sinkholes and long caves (two of the deepest in Europe are to be found there). Fossil sites expose remnants of life since the Carboniferous, marking the opening of Neotethys ocean and the evolution of the Hellenic orogen.

The Natural History Museum of Crete has started to map and study the geodiversity of Crete since the 2000 when an introductory book on the geodiversity of the island was published. Considering existing literature, geological maps, field guides and collecting local narratives and information, the Museum performed an extensive inventory to identify geological sites of International to local importance. A first study assessed the value of the most important geosites compared with other at National and International level, whereas at a later stage a new quantitative methodology was produced to assist the existing Psiloritis UGGp to manage is geodiversity in respect to tourism, educational and conservation needs. This inventory is ongoing adding information and data from new inventories and studies that are developing.

The geoconservation of Cretan geodiversity is not at the level that the broader scientific society would like to be, considering also the great pressure exerted from tourism and renewable energy constructions. It follows the weak Greek legislation on the topic. Only in 1985 under the law 1650 rock formations and landscape features could have been protected as Natural Monuments. A great advance was given by the Law 3937/2011 which for first time recognized the geosites as protected items, and foresaw the creation of geoparks as Nature Parks. However, that law changed again in 2022, abrogating the Nature Parks and geoparks too. So far only few geosites are protected as nature and geological monuments. The rest are either protected under other legislation types which foresee a protection of the natural environment as a whole (ie. Nature 2000 areas, Wild Life Refuges) or due to their existence within larger protected areas under the Archaeological or Forest legislation. The development of the UNESCO Global Geoparks in Greece (nine existing so far) gave a boost in the protection of their geodiversity, an optimistic message for the future.

INVENTORY OF SITES OF GEOLOGICAL INTEREST OF THE COSTA QUEBRADA UNESCO GLOBAL GEOPARK

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Keywords: Costa Quebrada UGGp, Sites of Geologic Interest, Inventory, dissemination tools.

The results obtained since the development of the first Inventory of Places of Geological Interest (LIG) of Costa Quebrada UNESCO Global Geopark are presented.

The Inventory has been carried out following the methodological procedure proposed by the Spanish Geological Survey (García Cortés et al., 2019), and for future inclusion in the Spanish Inventory of Geosites (IELIG).

The Inventory is made up of 52 LIGs, for which a database has been created in a GIS (Geographic Information System) environment and in which all the parameters for the description and valuation of each of them have been included.

For the evaluation of Geosites, indicators have been used to assess the Intrinsic Value, the Potential for Use and Protection Needs.

In order to establish the conservation and protection strategies, the vulnerability to natural and anthropogenic degradation, as well as the susceptibility to natural and anthropogenic degradation and, finally, the risk of natural and anthropogenic degradation and the Fragility of each Geosites have also been assessed.

For the dissemination of the results, descriptive sheets are being prepared and will be published on the website of the Costa Quebrada UNESCO Global Geopark, in collaboration with the Costa Quebrada Association and the company in charge of the design and maintenance of the official website of the Geopark.

On the other hand, the publication of a small guidebook is being finalised, which aims to show a description of the Geosites of the Geopark without including their evaluation, and only as a document for dissemination and as a field guide, for those who wish to deepen their knowledge of the geological heritage of the Geopark, and prefer a traditional support.

PHOTOGRAMMETRY IN GEOSITES OF SERIDÓ UNESCO GLOBAL GEOPARK: SUPPORT FOR GEOCONSERVATION

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Keywords: conservation, 3D modeling, assessment

Geotechnologies are increasingly present in the daily routine of scientific research, but also in societies around the world. Georeferencing of information, for example, is inherent to several applications that are continually used. Among the different methods that encompass geotechnologies, photogrammetry has been used to generate three-dimensional models, with scientific, educational and dissemination applications. It is also an important ally in expanding accessibility in geosites, especially for those with trails that are difficult for the general public to access, but also for the integration of people with disabilities, something that is facilitated for geosites with important geomorphological elements. Photogrammetry can also be a tool for environmental monitoring and the physical conditions of different geosites, with rapid results, for example, in the periodic observation of the evolution of weathering and erosive changes of a physical nature. In this sense, this work presents different photogrammetric models carried out in the territory of the Seridó UNESCO Global Geopark, Northeast of Brazil. Photogrammetry was used as a method, with the following steps: (i) collection of images in the field, ensuring lateral coverage between images; (ii) alignment of images in software; (iii) generation of sparse and dense point clouds; (iv) generation of triangular mesh; (v) creation of texture. The generated models are visualized in a computer environment, but can also be printed using 3D printers. The Morro do Cruzeiro and Pico do Totoró geosites, in the city of Currais Novos, Cruzeiro de Acari, in the municipality of the same name, and the Dinheiro Pegmatite Body, in Carnaúba dos Dantas, were imaged. In the case of the Morro do Cruzeiro Geosite, photogrammetry is used to monitor the erosion process, since the orthogonal fractures in the pegmatite body, typical of a castle koppie feature, favor physical changes in this site, which is widely visited. The other models can be used in actions to promote the geopark's heritage, which highlights its geomorphological characteristics, favoring the inclusion of different audiences, especially those with disabilities. Finally, it is clear that photogrammetry, as a relatively low-cost method, can be widely used in geopark territories for scientific research, geoconservation and dissemination actions.

GEOMORPHOLOGY OF THE CAÇAPAVA UNESCO GLOBAL GEOPARK (SOUTHERNMOST BRAZIL): FROM AN ACCESSORY SUBJECT TO AN ESSENTIAL ELEMENT IN PROMOTING GEOSITES

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Keywords: conglomerate geomorphology, geoheritage, tourism, education, scenic beauty

The existence of a geoheritage content of international scientific relevance is a fundamental condition for the certification of a UNESCO Global Geopark (UGGp). In the territory of the Caçapava UGGp, which corresponds to the municipality of Caçapava do Sul, south-central Rio Grande do Sul, this content has a remarkable geological/stratigraphical/tectonic stamp. Geoheritage in the territory and its geosites is mainly represented by the sedimentary and volcanic rocks of the so-called Camaquã Basin (Ediacaran to Ordovician), which materialise a singular moment: the "transition phase of the South American Shelf", an intermediate tectonic situation between Brasiliano/Pan-African orogeny and the inception of the intraplate Paraná Basin. The Serra do Segredo and Minas do Camaquã geosites are some prominent examples of this content. In recent years, a new approach has focused on those geosites, adding scientific value and increasing their geoeducational and geotourism potential. It was realised that their geomorphology, developed in the Cenozoic over the Ediacaran conglomerates, has remarkable scientific and scenic potential. Those geomorphological features in southernmost Brazil stand out in a global panorama alongside with other highlighted sites such as Meteora (Greece), Kata Tjuta (Australia), Danxia (China), as well as with Carpathian Mountains such as Bucegi and Ceahlău (Romania). Like in those prominent areas, in the Camaquã Basin-related massifs the landforms are controlled and dictated by that particular type of rock, conglomerate. Some of the features in Serra do Segredo and Minas do Camaquã that align with globally relevant shapes are: (1) conglomerate domes with steep to vertical edges, sometimes undulating or staggered, but with rounded tops; (2) accumulations of detached pebbles and cobbles in the flatter portions of the upper floors; (3) cavities controlled by discontinuities (bedding caves), arches and pillars, tafoni-type features; (4) honeycomb/stonelace features; (5) calcareous speleothems; in addition to (6) large collapsed blocks, resulting from mass movements (falling blocks), which accumulate at the base of the domes, giving rise to voids and cavities of large origin. The perception of the strong educational and tourism potential of these conglomerate geomorphology features has already changed part of the strategy for the focused geosites. Unprecedent scientific work has been done in order to fully understand and record the features in those areas, increasing knowledge about their origin. This is reflected also in the use of this knowledge: before, geomorphology was only an accessory subject facing the geological/tectonic importance of the areas. Nowadays, landforms are the key element in addressing the Serra do Segredo and Minas do Camaquã geosites for tourists and students. The geomorphological approach allows a much more complete and interesting dialogue not only with the scenic beauty, but also with the importance of such features as biodiversity refugia, as well as with the people's perception/pareidolia about what they see during their visiting/hiking experience.

NEW STUDY FINDS: SAIMAA RINGED SEAL IS OLDER THAN THE LAKE ITSELF

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Keywords: science, research, conservation

Saimaa UNESCO Global Geopark (UGGp) is located in Southeast Finland. It covers the southern part of Lake Saimaa, the largest lake in the country. Lake Saimaa was formed and developed as a result of uneven glacioisostatic uplift after the last glacial period, ca. 10 000 years ago. Saimaa ringed seal (*Pusa hispida saimensis*) is an endangered postglacial relict, living only in the lake Saimaa. The population of the seal is close to 500, making it one of the most endangered pinnipeds in the world.

Three subspecies of Ringed seals (*Pusa hispida*) are present as distinct populations in Fennoscandia: the Baltic ringed seal *P. h. botnica*, the Ladoga ringed seal *P. h. ladogensis*, and the Saimaa ringed seal *P. h. saimensis*. The presence of these subspecies has been explained by the isolation of the ringed seals into the Baltic Sea basin after the last glacial period with further entrapment of seals into Lake Ladoga and Lake Saimaa.

The history of this seal and its differences from other seals were studied in an international collaboration between researchers from the Universities of Helsinki, Eastern Finland and Copenhagen, as well as the Tokyo Museum of Natural History and the Natural Resources Institute Finland (Luke) and the article *Deep origins, distinct adaptations, and species-level status indicated for a glacial relict seal* was published in June 2025.

According to the genomic analyses that were used, the Saimaa ringed seal is evolutionarily much more differentiated than previously thought, having formed a separate evolutionary branch for at least 60,000 years. This evolutionary origin of the Saimaa ringed seals is further underscored by behavioural and morphological differences. The study group argues, that it is justified to treat the Saimaa ringed seals as bona fide species, *Pusa saimensis* and not as a geographic form or a subspecies of the Arctic ringed seal. Saimaa ringed seal is a truly unique relict, the last representative of the seals living in ancient ice lakes during the last glacial period.

Saimaa UGGp will continue to follow the subject with interest, to share the new information and to support conservation efforts of this very special seal.

CONTROLLED BURNING TO PROTECT THE ECOSYSTEM: COLLABORATIVE COMMUNITY ACTION IN MT. CHOKAI & TOBISHIMA ISLAND GEOPARK, JAPAN

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Keywords: Mt. Chokai & Tobishima Island Geopark, aspiring geopark, controlled burning, protection of the ecosystem, sustainable local development

Mt. Chokai and Tobishima Island Geopark is an aspiring geopark (aUGGp) located on the Sea of Japan side of northeast Japan. The geopark's main features include hilly terrain formed by the compression of the Pacific Plate, which became pronounced about 3 million years ago, and the active volcano Mt. Chokai which rises above it. In particular, the active faults involved in the formation of the hilly terrain, and the landforms created by the sector collapse of Mt. Chokai about 2500 years ago, are of high international geological value.

Tōshi Wetland, located over an area of about 2.6 ㎢ in the central part of the geopark, is a wetland that developed on the debris avalanche deposits from the sector collapse of Mt. Chokai about 2500 years ago. A mosaic-like pattern of wetlands and secondary grasslands lie across this hilly terrain formed by hummocks. The ecosystem here is maintained as a habitat for endangered aquatic and grassland organisms.

Behind the preservation of this natural environment is the action of local residents, who have maintained a tradition of controlled burning in spring for over 100 years. In addition to maintaining the grassland environment, the burning also contributes to soil improvement and pest control, making it essential for farming activities. However, due to the aging population, it is becoming more and more difficult to maintain these activities through the local community alone.

To improve this situation, the first author has been in dialogue with local residents since 2022, working to gain consent for people outside the district to participate in the controlled burn activities. In 2023, for the first time in the history of the district, the controlled burn was held with outside cooperation. Participants included geopark guides certified by the Mt. Chokai & Tobishima Island Geopark, university students, and specialists in controlled burning. The geopark management body took on a role of coordination and support.

In this presentation, we discuss the background of this initiative, as well as future prospects for improved visibility and ongoing support of the action of local residents.

EARTH'S BLUEPRINT FOR LIFE: GEODIVERSITY AS A DRIVER OF BIODIVERSITY IN CHELMOS VOURAIKOS UNESCO GLOBAL GEOPARK

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Keywords: geodiversity–biodiversity relationship, endangered species, Greece

The connection between abiotic (geological) and biotic (biological) environment is deeply intertwined. Geodiversity – the variety of geological features, soils, topography, and water systems – forms the foundation that sustains biodiversity. This diversity creates specialized ecological niches, allowing different species to thrive. Recent studies confirm that geodiversity positively influences biodiversity, reinforcing the importance of integrating geodiversity into nature conservation strategies. Despite ongoing challenges in quantitatively connecting geodiversity with biodiversity, interdisciplinary collaboration strengthens our understanding and protection of natural systems. Public awareness through education is also essential, as ecosystem conservation depends not only on institutions but also on human behavior.

The UNESCO Global Geopark of Chelmos-Vouraikos serves as a model area for exploring and promoting the geodiversity–biodiversity relationship. Its connection with protected areas (national park and NATURA 2000 areas) and significant scientific research highlights its value. Within this framework, five new geo-sites of combined geodiversity and biodiversity interest were identified and added to the already designated similar geosites, enhancing efforts in conservation, education, and public awareness. Each site demonstrates the link between specific geological features and the presence of rare or threatened species. The documented geosites include the Kalavryta marsh (a seasonal wetland hosting the endangered Alpine newt Ichthyosaura alpestris), the Chelmos Refuge limestone area (home to the critically endangered endemic mollusk Albinaria broemmei), the Peristera limestone slopes, which support the endemic plant Bolanthus chelmicus subsp. chelmicus, the centuries-old chestnut grove near Vesini village (illustrating the interplay between radiolarites, the produced soil and local vegetation) and the uplifted steep limestone cliffs near Peristera village (nesting grounds for golden eagles Aquila chrysaetos).

The selection and documentation of these geo-sites followed a scientific methodology, ensuring both ecological and interpretive value. Their promotion can offer multiple benefits, ranging from environmental protection to strengthening local tourism and ecological consciousness among local residents and visitors.

VOLCANIC LANDSCAPES IN CONTRAST: A COMPARATIVE STUDY OF GEOSITE MANAGEMENT AND VALUE ASSESSMENT IN TUNGURAHUA VOLCANO UNESCO GLOBAL GEOPARK (ECUADOR) AND THE ISLAND OF TENERIFE

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Keywords: geosite management, geotourism, volcanic geoheritage, value assessment, comparative methodology

Geoparks and other areas with outstanding geological heritage are key tools for conserving geodiversity, promoting sustainable tourism, and supporting regional development. Through geotourism, these territories foster collaboration among science, governance, and communities. This study adopts a comparative approach to assess volcanic heritage in two contrasting contexts: the Tungurahua Volcano UNESCO Global Geopark (GVT, Ecuador), located in an active subduction arc, and Tenerife Island (TI, Spain), shaped by intraplate ocean-island volcanism. The analysis explores how eruptive dynamics, tourism development, and community involvement influence geosite management and value assessment.

The main goal was to propose guidelines for evaluating the geotourism potential of volcanic geosites across different geotectonic and sociocultural settings. A total of 31 geosites (20 in GVT and 11 in TI) were analyzed using a mixed-methods approach combining GIS tools, descriptive statistics, and heatmaps. Scientific values, integrity, representativeness, rarity, and paleogeographic interes, and additional values, ecological, aesthetic, cultural, and economic, were assessed to support geoconservation strategies and diversify tourism offers sustainably.

Results show similar scientific value averages (0.75 vs 0.78), grounded in distinct features. Tenerife's prolonged volcanic dormancy ensures exceptional integrity, turning it into a well-preserved archive ideal for interpreting ancient processes. GVT, on the other hand, serves as a dynamic laboratory: constant activity at Tungurahua boosts representativeness and rarity, and some sites, like Valle Glacial Abraspungo also show high integrity. These differences demand tailored management, passive conservation and visitor control in Tenerife versus active monitoring and risk communication in Tungurahua.

Additional values also display close averages (0.51 in TI vs. 0.47 in GVT) but reveal different strengths. TI excels in ecological and aesthetic criteria due to Teide National Park's protection and scenic viewpoints. GVT stands out culturally: sites like El Templete and Las Caras highlight the strong link between volcanic landscapes and Kichwa rituals. Some sites, such as Flujo de Lava Baños (0.88), combine high ecological, aesthetic, and cultural values, suggesting strong potential for community-led geotourism. Accordingly, strategies should focus on environmental interpretation and visitor regulation in TI, and cultural safeguarding and co-created experiences in GVT.

In conclusion, both regions hold volcanic geoheritage of high scientific and social relevance, though requiring context-specific strategies. The comparative framework applied here proves useful for prioritising geosites and guiding integrated geoconservation and tourism practices. It also aligns with Sustainable Development Goals 11, 13, and 15, offering a replicable model for other volcanic regions seeking resilience and community empowerment.

NESTING ON ICE: REPRODUCTIVE STRATEGIES OF THE GLACIER FINCH (IDIOPSAR SPECULIFER) ON THE GLACIERS OF THE QUELCCAYA GLACIER GEOPARK

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Keywords: Glacier Finch, Idiopsar speculifer, Quelccaya Glacier Geopark, nest microclimate

Glacial ecosystems are among the most extreme and least studied on the planet. Understanding how organisms survive and reproduce in these environments is key to their conservation, especially in the face of rapid glacial retreat due to climate change. The Glacier Finch (Idiopsar speculifer) is the only bird known to consistently nest in ice cavities within tropical glaciers. However, significant knowledge gaps remain regarding its active nests and the surrounding microclimatic conditions. In this study, conducted between 2024 and 2025 in three sectors of the western side of the Quelccaya Ice Cap, within the Quelccaya Glacier Geopark (southeastern Peru, above 5300 m a.s.l.), we documented nest structure, parental behavior, and the microclimate of ice cavities used for nesting. Our findings reveal that the nests are large, open-cup structures built with locally collected high-Andean grasses. We observed biparental care, with 8 to 9 daily visits focused on feeding and cleaning, and no nocturnal activity. We also report, for the first time, a predation event by an Andean fox. Additionally, we found that glacier cavities acted as thermal buffers, maintaining temperatures near 0 °C, high relative humidity (90–100%), and a low evaporation rate (0.2 $kg \cdot m^{-2} \cdot h^{-1}$), creating a more stable and favorable environment for nesting than the external conditions. These results provide key insights into the physical and behavioral mechanisms that enable reproduction in glacial habitats and offer valuable tools for assessing the impacts of glacial retreat on this species.

THE GEOLOGICAL HISTORY OF QUELCCAYA: A TROPICAL GLACIER RESTING ON VOLCANIC BEDROCK

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Keywords: geoscience and research, geological heritage, Quelccaya Glacier, Tectonics and Volcanism

Quelccaya Glacier, located in the southern Peruvian Andes, is the largest tropical ice cap in the world and a strategic component of the Andean geological heritage. This study aims to reconstruct the geological history of its bedrock, focusing on the interaction between tectonic processes, volcanic activity, and glacial dynamics in a high-mountain environment.

The investigation integrates geological mapping, petrographic analysis, structural interpretation, and 3D modeling, complemented by field observations and geospatial data processing. The glacier's substrate is dominated by the Quenamari Formation, a rhyolitic ignimbritic volcanic unit of Miocene–Pliocene age that covers over 90% of the exposed surface. This formation is subdivided into three members—Chacacuniza, Sapanuta, and Yapamayo—which reflect distinct eruptive phases and evidence of supergene alteration. Lithologies such as rhyolitic tuffs, porphyritic rhyodacites, columnar jointing, lapilli, and lithic fragments were identified, indicating a high-energy eruptive history.

Structurally, Quelccaya rests upon a system of normal faults trending NW–SE, accompanied by fracture systems trending N–S, E–W, and NW–SE. These structures developed in an extensional regime that followed compressive events associated with the Andean tectonic cycle. Their configuration conditioned the formation of graben-type depressions, which served as natural receptacles for volcanic deposits and, later, for the accumulation of glacial ice. Additionally, isoclinal folds and high-angle reverse faults have been identified, influencing the topographic configuration and glacial morphology of the area.

From a geomorphological perspective, Quelccaya displays classic glacial landforms such as moraines, U-shaped valleys, proglacial lakes, and abrasion surfaces, whose distribution is closely related to the structural control of the terrain. These features not only reflect the effects of rapid glacial retreat due to climate change, but also shape a geological landscape of high heritage value.

This work contributes to the geoscientific understanding of the aspiring Quelccaya Geopark, providing key inputs for its scientific and educational valorization. The glacier's geological history illustrates the close relationship between Neogene acidic volcanism and the evolution of tropical Andean ice masses, establishing Quelccaya as a natural laboratory for paleoclimate research, geoeducation, and sustainable territorial management.

YIMENGSHAN UNESCO GLOBAL GEOPARK: AN INTEGRATED ECOLOGICAL COMMUNICATION MODEL FOR SCIENTIFIC POPULARIZATION AND CULTURAL HERITAGE PRESERVATION

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Keywords: Nnw media communication, science popularization, cultural heritage, folk culture

Positioned at the intersection of scientific research, science communication, and cultural heritage preservation, Yimengshan UNESCO Global Geopark has pioneered an integrated "new media + geo-humanities" communication ecosystem. Collaborating with expert teams, we developed the *Doctor & Mengmeng* series of animated science shorts, using engaging visuals to decode the formation mysteries of Daigu landforms, while leveraging internet influencers to propel "geopark virality." The *Mengshan And I* docudrama series intertwines geological narratives with intangible cultural heritage—including diamond mining memories and Yimeng pancake craftsmanship—revitalizing red culture and geological legacy in contemporary contexts.

Through a multi-platform matrix spanning WeChat Official Accounts, Video Channels, and Tiktok, coupled with bilingual video production and a continuously updated English website, we achieved:

Youth engagement (65% users aged 18-35)
80% fan growth
40% YoY increase in educational tourism

Our experience demonstrates that new media technologies serve as a bridge connecting science, culture, and the public, offering a "Yimeng Model" for sustainable development of global geoparks.

HENODUS AND OTHER TRIASSIC VERTEBRATES FROM THE ALGARVENSIS GEOPARK, PORTUGAL

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Keywords: Silves Group, Metoposaurus algarvensis, phytosaur, Henodus, Algarvensis aUGGp

The Silves Group represents the Triassic period in Portugal and is well-exposed in the territory of the aspiring Algarvensis UNESCO Global Geopark (aUGGp), located in southern Portugal. This stratigraphic sequence, composed predominantly of continental sediments, has yielded a rich assemblage of vertebrate fossils in recent years — the only confirmed Triassic vertebrate fossils found in Portugal to date. These discoveries have contributed significantly to the scientific and cultural value of the Geopark, offering a rare glimpse into ecosystems that existed shortly before the end-Triassic mass extinction. The Late Triassic was a period of significant evolutionary turnover in vertebrate history. The fossil record of the Algarve provides crucial data on the faunal transitions that characterised this time. Among the most remarkable findings is a dense bonebed near the village of Penina, containing numerous elements of *Metoposaurus algarvensis*, a large temnospondyl amphibian unique to this region. Additional discoveries have further enhanced the paleontological relevance of the region. The same site has yielded shark remains, mastodonsaurid fossils, the first phytosaur fossils known from the Iberian Peninsula and several isolated carapace plates attributed to cyamodontoid placodonts. Recent fieldwork has also uncovered a partial skull identified as *Henodus* sp. *Henodus*, previously known only from the Germanic Basin in central Europe, is an enigmatic placodont reptile adapted to life in brackish or freshwater environments. The Algarvensis skull represents only the second known record of this genus and significantly extends its known geographic range to the southwestern margin of the ancient Neotethys Ocean. Although the precise age of the rock layer remains under study, the fossil likely dates to between the late Carnian and Rhaetian periods, possibly making it slightly younger than its German counterpart. The paleoenvironmental context suggests a coastal continental setting, consistent with *Henodus*' ecological preferences. These vertebrate fossils are not only scientifically essential but have also become symbols of local identity and pride. They serve as ambassadors of both palaeontology and geodiversity in the Algarvensis aUGGp, contributing to the region's educational outreach and geoheritage value. Continued research and discoveries promise to illuminate further the evolutionary and biogeographic dynamics of the Late Triassic in southern Europe. As such, the Algarvensis aUGGp is actively working to preserve this unique heritage and to support scientific research that deepens knowledge of these Triassic ecosystems. The Algarvensis aUGGp welcomes researchers interested in studying its fossil record and paleoenvironmental context and seeks to establish partnerships with other aspiring and official UNESCO Global Geoparks, universities, and research institutions. By fostering international scientific collaboration and positioning itself as a living laboratory, Algarvensis aUGGp aims to make meaningful contributions to the global geoscientific community and reinforce its potential role within the UNESCO Global Geoparks Network.

THE EVOLUTION OF GRANITE DOME AND GEO-DIVERSITY IN WUGONSHAN GEOPARK OF CHINA

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Keywords: evolution of granite dome, geo-diversity research, Wugongshan UGGp

Wugongshan UGGp is renowned for its rich geological heritage, particularly its massive and well-preserved Mesozoic granite dome. The geological evolution of this granite dome has controlled the formation and vertical distribution of various types of landscapes within the geopark. The diverse sites of geological interest and landscapes, along with the granite dome, collectively constitute a unique whole, a characteristic that is rare among global geoparks. Therefore, the geological heritage of Wugongshan UGGp holds significant research value and international significance. In this paper, we provide a detailed introduction to the diversity of geological, geomorphological, and hydrological characteristics and processes of Wugongshan UGGp, analyzing the kinematic polarity of granite dome from a structural deformation perspective and comparing the evolution of granite domes with similar features in other global geoparks. Our findings reveal that the abundant geological and geomorphological resources of Wugongshan UGGp not only serve as a natural laboratory for scientific research but also lay a solid foundation for promoting popularization of geosciences.

INVENTORY AND CHARACTERIZATION OF GEOSITES: ANALYSIS AND PROPOSED METHODOLOGY FOR THE IMBABURA UNESCO GLOBAL GEOPARK

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Keywords: Imbabura Geopark, geosite classification, geoconservation, geotourism, holistic methodological framework

The Imbabura UNESCO Global Geopark, declared in 2019, is in the northern Ecuadorian Andes and is a national and international benchmark for its geological, cultural, and biological diversity. In a reevaluation of the current geopark inventory, several ambiguities were identified in the criteria for establishing and specifying the geosites, as well as their sites of geological interest. Hence, this proposal aims to establish a comprehensive and replicable management model for geological heritage in Ecuador. This analysis presents a literature review of methodologies used globally, with the goal of adapting an approach relevant to the Imbabura UNESCO Global Geopark. The method considers scientific, educational, tourism, cultural, and biological values, along with spatial criteria, human-induced vulnerability, and national tourism guidelines. Consequently, it provides a validated and locally adapted methodology for geosite classification, providing a functional model to support decision-making in geoconservation and a set of strategic guidelines for updating, managing, and disseminating the inventory. The results seek to support territorial planning, promote geotourism, and strengthen geoscience education, enabling community participation within the geopark and consolidating Imbabura's position as a national and international benchmark in sustainable geosites management.

NEW PALYNOSTRATIGRAPHIC DATA FROM THE TRIASSIC-JURASSIC TRANSITION IN THE SILVES GROUP, ALGARVE BASIN, PORTUGAL

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Keywords: Loulé Salt Mine, pollens, spores, mass extinction, Geopark Algarvensis

This work presents palynostratigraphic results that help specify the age of the Silves Group units in the Algarve Basin, Portugal. The Silves Group is the oldest sedimentary unit in this basin. It rests unconformably on the Upper Carboniferous turbidites of the Brejeira Formation, which were folded and fractured during the Variscan Orogeny. The palynological associations obtained from studies along the Silves Group enable us to date the beginning of sedimentation in the Algarve Basin to the Lower Carnian). Palynological studies of the sedimentary package known as the 'Silves Sandstones' place this unit in the Carnian. The basal layers of the 'Silves Evaporitic Marl-Carbonated Complex' are from the Upper Carnian. Within the evaporites of the Loulé Salt Mine, the palynological association, marked by the first appearance of Cerebropollenites macroverrucosus, Cerebropollenites sp., and Perinopollenites elatoides, suggests an age between the upper Rhaetian (Upper Triassic) and the base of the Hettangian (Lower Jurassic). This marks, for the first time, the boundary between the Triassic and Jurassic in the Algarve Basin, Portugal. The discovery of the Triassic–Jurassic boundary (TJB) within the salt deposits of the Loulé Salt Mine, one of the six internationally significant geosites of the Algarvensis aspiring UNESCO Global Geopark, highlights the importance of Geoparks for scientific research. In this case, the TJB is one of the five major mass extinctions that have occurred over the last 541 million years.

INSIGHTS INTO WATER RESTORATIONS IN SENSITIVE ESKER AND DUNE AREA IN ROKUA UGGP, FINLAND

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Keywords: conservation, water restoration, geomorphology, geopark

Rokuanvaara Hill is located in the central part of Rokua UNESCO Global Geopark. It is an esker and dune complex with a mixture of glacigenic, glaciofluvial, lacustrine, littoral, eolian and biogenic landforms. The properties and amount of sand in the esker dissociates the complex from most of other eskers in Finland.

The topography of the main Rokuanvaara Hill complex is dominated by esker mounds, kettle holes and parabolic dunes. The esker is nowadays an important aquifer, and part of the kettle holes are filled by groundwater. Part of the lakes and shores are protected, preventing construction and keeping the lakes wild.

For over two decades, there has been intensive research to understand the dynamics of groundwater and the interactions between groundwater and surface water better. Recently, among the locals, there has been increasing concern for water quality of the lakes, leading to willingness to restore the lakes.

To be able to draw up a restoration plan for the vulnerable lakes, Rokua Geopark conducted inventions for water plants abundance and species composition as well as for fish populations in the lakes in the summer 2023. In year 2024, Oulu University coordinated nitrogen-isotope research to understand the origin (natural or human-induced) of nitrogen in the lakes.

The scientific understanding of the water level and water quality variation as well as of the nitrogen isotopes was combined to the results of the ecological inventions to get wider deeper understanding of the most effective actions to improve the ecological, chemical and recreational values of the lakes.

It seems, so far, that the most important factor for the nutrient level in the lakes lies in geomorphology of the esker. As the sand originates mostly from Proterozoic marine sediments, it is rich in calcium and phosphates, for example. The longer the groundwater flows through the sediments, the more nutrients dissolve in water. This leads to higher nutrient levels and higher biomass production in lower-elevated lakes. In addition, the initial results of the nitrogen studies suggest that only few of the eutrophic lakes have nitrogen from human activities.

It can be concluded, that the natural drivers are so strong, and the human influence is so minor, that it is not possible to change the eutrophication level of the lakes. Instead, in water restoration activities, it would be recommended to focus on maintaining the recreational values of the lakes without endangering the natural ecosystems and recovering the natural state of the ecosystem in the lakes where appropriate, like the ones having experienced selective fishing. A local water conservation association was established in the beginning of 2025 and they started restoration activities in summer 2025.

CONSERVATION, SCIENTIFIC RESEARCH AND UTILIZATION OF DINOSAUR FOSSIL HERITAGE IN ZIGONG GLOBAL GEOPARK

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Keywords: dinosaur fossil site, conservation, scientific research, utilization, geopark

Zigong Global Geopark is located in Zigong City, Sichuan Province, China, covering an area of 1,630.46 km^2. It is renowned for its Jurassic dinosaur fossils, Triassic well-salt relics and colorful lantern. The geopark has 103 geosites, including 5 world-class ones, 7 national-level ones, 22 provincial-level ones, and 69 municipal-level ones. The geopark is famous for its numerous, diverse, concentrated and well-preserved Jurassic dinosaur fossils. At present, there are 26 species of dinosaur fossils belonging to 21 genera, accounting for about 1/2 of the total in Sichuan Province and about 1/12 of the total in China. It is one of the most important dinosaur fossil preservation areas in both China and the world, earning it the title of the "Hometown of Dinosaurs".

Zigong Global Geopark has formed a relatively complete system for the conservation, scientific research, and utilization of dinosaur fossils. This article will give an illustrate through specific examples.

1. Dinosaur Fossil Conservation. Zigong Global Geopark has adopted in-situ protection measures for three important sites: the Dashanpu Dinosaur Fossil Site, the Omeisaurus jiaoi Dinosaur Fossil Site, and the Qinglongshan Dinosaur Fossil Site. Special protection zones and facilities have been established, and advanced technical methods are used to monitor the preservation environment of the fossils. Professional restoration work has been conducted on the excavated fossils, and a fossil specimen repository has been built to store the fossils in a standardized manner. The "Regulations on the Protection of Dinosaur Geological Heritage in Zigong City" has been enacted to legally safeguard these fossils.

2. Dinosaur Fossil Research. Researchers at Zigong Global Geopark have consistently conducted scientific research through investigations, fossil specimen analysis, stratigraphic comparison, etc. Numbers academic papers on Zigong's Jurassic dinosaurs has been published. Additionally, Zigong has hosted several academic conferences focused on dinosaurs to share experiences in the protection and utilization of dinosaur fossils, thereby enhancing its influence in the field of international paleontological research.

3. Sustainable Utilization of Dinosaur Fossils. Zigong Global Geopark actively engages the public through fossil exhibits, restored models, and science popularization activities, effectively conveying the scientific significance of dinosaur fossils. Zigong integrates its dinosaur fossil resources with tourism by attracting visitors to dinosaur sites and museums, developing dinosaur-themed souvenirs, thereby promoting local sustainable development.

ENHANCING THE ROLE OF CONSERVATION IN PROTECTED AREA MANAGEMENT VIA GEOPARK INITIATIVE IN SARAWAK, MALAYSIA

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Keywords: conservation, geoheritage, geopark, protected area, Sarawak

Sarawak is boldly stepping forward in its mission to protect the environment through transformative initiatives. From establishing cutting-edge conservation centres and gazetting protected areas to advancing research, promoting environmental education, and enforcing critical legislations—these efforts reflect the State's unwavering commitment to ecological preservation. The first protected area in Sarawak was gazetted in 1957. These protected areas play a vital role in safeguarding biodiversity, empowered by the National Parks and Nature Reserves Ordinance and the Wild Life Protection Ordinance. In 2019, the launch of the Geopark initiative marked a new chapter in conservation—extending protection beyond biodiversity to embrace geoheritage, recognizing the rich geodiversity embedded within Sarawak's landscapes. At the heart of this movement lies the Sarawak Delta Geopark, which today encompasses 12 protected areas, including marine protected areas, one RAMSAR site, one Asian Heritage Park, and a vital part of the East-Asian Australasian Flyway Network. Together, these sites represent 18% of Sarawak's total protected areas, each one unique and ecologically significant. Beyond preservation, the Geopark has inspired a cultural shift—empowering local communities to become stewards of the environment, actively participating in conservation and protection efforts. Supported by a collaborative network of stakeholders, Sarawak's approach continues to redefine conservation and reinforce its role in safeguarding the State's natural treasures.

RESEARCH, CONSERVATION, AND SCIENCE COMMUNICATION OF DANXIA LANDFORMS IN CHINA'S UNESCO GLOBAL GEOPARKS

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Keywords: Danxia landforms, global geoparks, scientific research, conservation

As the number of China's UNESCO Global Geoparks continues to rise, an increasing number of these sites feature Danxia landforms, including Taining, Longhushan, Danxiashan, Longyan, Zhangye, Linxia, and Kanbula Geoparks. Spanning both northern and southern China, these geoparks exhibit distinct landform and climatic characteristics shaped by divergent tectonic frameworks and geological evolutionary histories. Collectively, they form a spectacular array of Danxia landscapes, providing invaluable samples for scientific inquiry into Danxia landforms.

The interpretation of research findings into public outreach content constitutes a critical bridge from basic research to widespread dissemination, profoundly influencing public perceptions of geological heritage and conservation awareness. A notable controversy arose in Zhangye when promotional materials conflated "colorful hills" with Danxia landforms, highlighting the imperative of in-depth research on Danxia landforms. Accurate scientific understanding, thus, serves as the cornerstone for effective conservation and science communication.

Current research on China's Danxia landforms is progressively reconstructing an "epic of Danxia" spanning hundreds of millions of years. Since the Late Mesozoic, northern and southern China have followed distinct evolutionary trajectories amid geological processes such as plate subduction and crustal extension. In southern regions like Taining, crustal extension led to the formation of fault basins, where deposited red sandstone and conglomerate were sculpted by later endogenic and exogenic forces (e.g., weathering and erosion) into young-stage Danxia features — characterized by reticulated valleys and cliff caves. The humid climate further enhances these landscapes, creating harmonious vistas of Danxia landforms mirrored in clear waters. In northern areas such as Kanbula, magmatism driven by plate activity imprinted unique signatures on the strata, while the arid, low-precipitation climate preserved Danxia landforms in a more rugged form. Folds and fractures in the rock layers here vividly record the Earth 's tectonic pulses. These divergent landform and climatic traits, rooted in differences in tectonics and evolutionary history, render China's Danxia landforms a living archive of natural evolution. Case studies of Taining and Longhushan Geoparks, for instance, have refined understanding of the staged formation mechanisms and scientific significance of their Danxia landforms.
In science communication, Global Geoparks nationwide are pioneering innovative approaches. Through exhibitions, field studies, and other diverse formats, they disseminate Danxia knowledge to the public. Examples include AI-powered immersive experiences that simulate Danxia formation processes, and interactive educational programs and games designed to enhance engagement and outreach. These initiatives have effectively stimulated public interest in geological science, fostered conservation of geological heritage, and promoted synergistic development in conservation, research, and communication within Global Geoparks.

THE ROLE OF UNESCO GLOBAL GEOPARKS IN ENHANCING CULTURAL ECOSYSTEM SERVICES

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Keywords: UNESCO Global Geoparks, cultural ecosystem services, Oeste UGGp, ecosystem-based approach, sustainable local development

Humankind and the Ocean share a long history. Most of the world's population is settled near the sea, with major cities located along the shoreline. This connection between humans and the coastal environment allowed the development of cultural traditions, unique lifestyles and economic activities. Nevertheless, this makes marine and coastal ecosystems more susceptible to anthropogenic risks like overexploitation, pollution, biodiversity loss and climate change.

Research on Ecosystem Services (ES), especially Cultural Ecosystem Services (CES), can help mitigate those impacts. CES are characterized by their intangible nature, providing non-material benefits for people, but also being more complex to analyze.

The values of UNESCO Global Geoparks (UGGp) are perfectly aligned with the preservation and enhancement of CES because of their connection with the cultural heritage of the communities. These territories promote cultural identity, due to their socio-cultural nature, which is extremely important for the sustainable CES flow. Including CES knowledge in UGGp decision-making processes is a valuable tool for the sustainable development of these territories. Although the use of ES in decision-making processes is becoming more frequent, a clear gap remains in ES data, particularly regarding CES in UGGp. This gap is even more notorious in coastal and marine UGGp.

Acknowledging this overlooked topic is fundamental to understanding the role of UGGp in protecting ecosystems and their respective ES, and how an ecosystem-based approach can be implemented in the UGGp management plans. Within this context, the unique geological and cultural characteristics of the Oeste UGGp provide a valuable opportunity for enhancing CES research within UGGps. The cultural heritage of this territory is deeply interconnected with its geology, resulting in a strong relationship between the community and the CES supply. These distinctive features enable the development of CES research that can subsequently be applied across the Global Geoparks Network.

GROUNDBREAKING FOSSIL DISCOVERY AND RESCUE AT SALTERN COVE, ENGLISH RIVIERA UNESCO GLOBAL GEOPARK, UK

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Keywords: fossil, recovery, Devonian, tree, Lycopsid

A groundbreaking fossil discovery from the Saltern Cove Site of Special Scientific Interest (SSSI) within the English Riviera UNESCO Global Geopark promises to shed new light on the region's rich geological history.

Believed to be around 377 million years old, the Devonian aged fossils were discovered by Dr Kevin Page, President of ProGEO and Honorary Senior Research Fellow at Camborne School of Mines, University of Exeter, during a condition survey of the Geopark's SSSI sites for the national statutory body, Natural England.

More research will follow but the fossils, identified as pieces of roots and bark belonging to primitive lycopsid trees, provide a unique glimpse into the ancient landscape of the Geopark - which extends from Brixham to Maidencombe, encompassing the whole of Torbay and its marine territory. Looking a little like the famous Torbay palm of today, these early, simple trees were the ancestors of the giant trees that contributed to coal formation during the later Carboniferous time period, but reached heights of only around 4 metres.

The discovery has sparked excitement among the scientific community as they provide valuable new insights into the ancient environments of Torbay, including the presence of volcanic islands with trees growing on them. Further research is underway, but this could potentially be the first record of a Devonian desert island with trees - a truly remarkable find.

Due to the significance of the find, the discovery was kept 'under wraps' whilst the Geopark coordinated a working group, bringing together experts from the Universities of Exeter, Plymouth, Cardiff and Lille in France, along with Natural England, to ensure the best and most appropriate outcomes for the find. Following site meetings and much discussion, it was concluded that as the fossils were at risk from both natural coastal erosion and unauthorised activities, the only option was to recover them. Being an area of international significance and with a finite geological fossil resource, the Geopark ensured that all of the required permissions were in place and meticulous care was taken to carefully excavate and protect the fossils for future generations. The recovery was led by expert geologists and assisted by local volunteers, including winching the fossils from the beach to the cliff top by Hi Line, all supervised by Health and Safety professionals.

The fossils, now safely housed in Torquay Museum, are a remarkable find and a testament to the unique and diverse geological history and landscapes of the English Riviera UNESCO Global Geopark, an area that still has so much to reveal.

STRENGTHENING SCIENTIFIC RESEARCH AND CONSERVATION FOR SUSTAINABLE DEVELOPMENT IN THE ASPIRING LENGGONG UNESCO GLOBAL GEOPARK

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Keyword: geoheritage conservation, scientific research, sustainable development, community empowerment

The Aspiring Lenggong UNESCO Global Geopark (aUGGp), located in Perak, Malaysia, is a region of exceptional geological, archaeological, biological, and cultural heritage. Recognized as a UNESCO World Heritage Site in 2012 for its outstanding geoarchaeological significance, Lenggong Valley reflects 1.8 million years of Earth's history intertwined with early human civilization. The Scientific and Conservation Committee (SCC) plays a pivotal role in balancing heritage preservation with sustainable development within the geopark's boundaries.

The SCC coordinates multidisciplinary efforts to conserve geoheritage, bioheritage, archaeology, and cultural heritage, ensuring alignment with environmental policies and legal frameworks, including the National Heritage Act 2005 and National Forestry Act 1984. With 63% of the geopark designated as Permanent Forest Reserve and several sites protected under Environmentally Sensitive Areas (ESA), conservation is tightly integrated with ecological management, disaster risk reduction, and biodiversity protection.

Scientific research forms the foundation of the SCC's approach. Through collaborations with national and international institutions such as Universiti Sains Malaysia (USM), Universiti Kebangsaan Malaysia (UKM), and global geopark networks, the committee supports ongoing studies in geoheritage mapping, renewable energy, and climate change mitigation. These efforts are complemented by public engagement initiatives designed to raise awareness of heritage preservation while promoting community empowerment through geotourism and sustainable livelihoods.

Strategic partnerships at local, national, and international levels further strengthen the Lenggong aUGGp's position. Its active participation in the Malaysian National Geopark Network, the Malaysia-Indonesia Geoparks Network (MIGN), and sistership plans with Toba UNESCO Global Geopark in Sumatra underscores a collective commitment to heritage conservation and knowledge exchange.

By integrating science, conservation, and community-based tourism, the SCC advances Lenggong's aspiration to achieve full UNESCO Global Geopark status. Its holistic approach not only safeguards the area's diverse natural and cultural resources but also supports regional development goals, including the Perak Sejahtera 2030 Plan and the Perak State Structure Plan 2040. Ultimately, the Lenggong aUGGp serves as a model for harmonizing heritage conservation with socio-economic growth, ensuring that its rich legacy is preserved for future generations.

GEOCONSERVATION OF FOSSILIFEROUS SITES IN PERIGLACIAL AREAS: THE TYNDALL ICHTHYOSAURS STUDY CASE IN TORRES DEL PAINE NATIONAL PARK (CHILE)

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Keywords: conservation, geoconservation, monitoring, paleontological heritage

Paleontological heritage is fragile and non-renewable, which should be reflected in its management strategies due to its scientific and educational relevance. A wide range of natural physical, chemical and biological processes, together with human access and activities, can threaten the stability of *in situ* paleontological heritage, with weathering and erosion generally being the main natural processes affecting the stability of fossils, contributing to their destruction. Therefore, it is of vital importance to ensure their preservation over time using geoconservation strategies that are best adapted to the conditions of the fossil site. This study proposes *in situ* conservation and monitoring methods, both important elements of any geoconservation strategy, for the Tyndall Glacier fossil site (Chile), which contains almost hundred articulated and practically complete ichthyosaur skeletons. However, this site, located in a periglacial area, presents numerous logistical challenges due to its geological, geographical and climatic characteristics, as well as its remoteness, which makes the physical protection of these fossils extremely difficult. To establish the most appropriate conservation and monitoring methods, the following aspects were analyzed: (1) the action of the glacier on the fossils, whose retreat has contributed to the exposure of the ichthyosaurs in the last 80 years; (2) the deterioration factors, divided into four types: climatic (temperature, precipitation, relative humidity, wind and UV radiation), geological (gelifraction, deformation, mineralization and glacial erosion), biological (lichen and mosses), and anthropogenic; (3) the percentage of exposure of the ichthyosaurs; and (4) their state of preservation and damage. The results allowed the establishment of 4 conservation methods and 6 monitoring methods. Each of these proposed methods aims to facilitate logistical aspects given the characteristics of this site and must be environmentally friendly given that the fossil site is located within a protected area. The results obtained in this study are crucial to lay the basis for the development of a proper geoconservation strategy for the Tyndall ichthyosaurs that will ensure their preservation for scientific research, education and future generations.

PEATLANDS AND THEIR STRATEGIC VALUE IN THE QUELCCAYA GLACIER GEOPARK IN THE FACE OF CLIMATE CHANGE

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Keywords: peatlands, climate change, geopark, Quelccaya glacier

Bofedales are a type of wetland capable of accumulating organic matter under conditions of permanent saturation, functioning as high-Andean peatlands. Globally, peatlands cover approximately 3% of the Earth's land surface, yet they store about one-third of the world's soil carbon and twice as much carbon as the biomass of all forest ecosystems combined. In the South American Andes, bofedales provide essential ecosystem services that sustain the balance of mountain ecosystems and, consequently, the livelihoods of high-Andean populations. They offer water regulation services, contributing to water security—an aspect that is critical in the context of climate change and glacial retreat. Moreover, they are important sources of livelihood by providing forage for the breeding of South American camelids, which are a fundamental economic activity in the Andes.

However, bofedales are fragile ecosystems in the face of climate change, as variations in precipitation and glacier loss affect their main water sources, increasing hydrological seasonality. This accelerates peat decomposition, reducing their carbon sequestration capacity. Therefore, this study aimed to identify seasonal bofedales within the proposed area of the Quelccaya Glacier Geopark, located in the southern Peruvian Andes between the departments of Cusco and Puno, covering approximately 720,185.4 hectares. Sentinel-2 satellite imagery and Sentinel-1 radar data were used, applying spectral indices and advanced algorithms within the Google Earth Engine (GEE) platform, alongside Random Forest (RF) algorithms to classify peatlands. Validation was carried out at 35 points within the area of influence of the Quelccaya glacier.

The results indicate that within the Quelccaya Geopark area, there are 25,112.6 ha of bofedales, of which 43% exhibit a seasonal hydrological regime due to partial or total reduction of their main water source. These changes in hydrological dynamics are accelerating the degradation of stored peat, releasing greenhouse gases. These findings provide timely and accurate scientific information on the status of bofedales. The Quelccaya Glacier Geopark represents a critical opportunity for sustainable land management that promotes policies and strategies for the restoration and conservation of bofedales. In this way, the geopark could contribute to the sustainable development of local communities through the management of mountain ecosystems, reducing the vulnerability of both ecosystems and populations to the impacts of climate change.

CHARACTERISTICS AND GENESIS OF CRETACEOUS RHYOLITIC LANDFORMS IN SOUTHEASTERN CHINA: A CASE STUDY OF THE YANDANGSHAN UNESCO GLOBAL GEOPARK

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Keywords: geomorphic genesis, Rhyolite landscape, SE China

Rhyolitic volcanic rocks (SiO_2 > 65%) are not only high-quality construction materials but also form stunning natural landscapes. Typically found at active continental margins, these rocks often develop diverse geomorphic features due to exogenous erosion after lithification. The Southeastern China (SE China) is geologically distinguished by large-scale exposures of Cretaceous rhyolitic volcanic rocks, forming a volcanic belt approximately 1,200 km long and 500 km wide, trending northeast and referred to as the "Silicic Large Igneous Province."

From 2008 to 2018, China conducted a nationwide survey of significant geological heritage sites, identifying 6,228 provincially or nationally important geological relics, including 329 volcanic geological relics—129 of which are concentrated in SE China. Leveraging these resources, China has established 30 national volcanic geoparks and 8 global geoparks, with 19 national and 4 global geoparks located in SE China. The geoheritages in these volcanic geoparks primarily feature rhyolitic volcanic landforms, often developed within thick layered rhyolite strata within calderas, characterized by steep cliffs and flat summits. Examples include the Yandangshan, Xiandu, Shenxianju (Zhejiang), Jiaoye, Fozishan, and Lingtongshan (Fujian) geoparks. Among these, the Yandangshan UNESCO Global Geopark boasts the most complete and representative rhyolitic landforms. Located on the western Pacific coast of southeastern Zhejiang Province, it is a quintessential Cretaceous rhyolitic caldera within the circum-Pacific Asian continental margin volcanic belt, documenting a full volcanic cycle of eruption-collapse-resurgence. It stands as a globally significant example of ancient rhyolitic volcanism.

Researches indicate that the rhyolitic landforms in SE China, exemplified by Yandangshan, can be classified into columnar peaks, stacked cliffs, and lava caves, their morphology and distribution strongly controlled by volcanic structures and lithofacies. Additionally, these landforms exhibit three distinct planation surfaces:

1. An initial surface (~60 Ma, early Cenozoic), preserved along Yandangshan's main ridgeline at 850–1,000 m;
2. A secondary surface at 450–550 m, formed in the late Eocene (~40–30 Ma);
3. A tertiary surface at 100–200 m, shaped since the Miocene (~16–11.5 Ma).

These surfaces reflect at least three uplift-denudation events, resulting from the dynamic interplay of the Pacific, Philippine Sea, and Eurasian plates, coupled with far-field effects of the Indian Plate's collision.

GEOLOGICAL AND GEOMORPHOLOGICAL HERITAGE OF THE ANERGUI VALLEY, M'GOUN UNESCO GLOBAL GEOPARK (MOROCCO)

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Keywords: Moroccan High Atlas, UNESCO Geopark M'goun, Anergui, geosites, Alpine Geological History

The Anergui Valley, located in the central High Atlas of Morocco, lies at the heart of the UNESCO-recognized M'Goun Global Geopark. This high-altitude valley, sculpted by the Assif Melloul River, is framed by imposing limestone-dolomitic cliffs and mountainous plateaus that exceed 3000 meters in elevation. These cliffs host striking geomorphological features, including jagged lapies fields and karst depressions such as sinkholes, most prominently observed on the Ait Abdi Plateau. Structurally, the valley represents a broad erosional basin (combe) bounded by deep gorges, including those of Akhachane and Batli. At its geological core, the valley exhibits a complex intrusive body, consisting of coalesced gabbroic masses interlayered with fragments of metamorphosed Lower Liassic limestones, all set within a matrix of Triassic red clay-sandstone. This structure highlights a dynamic geodynamic history shaped by multiple orogenic and sedimentary processes.

The systematic identification, characterization, and valorization of these geosites form part of an ongoing strategy to promote geoheritage and geotourism in the Geopark. Several key geological phenomena underpin the significance of the Anergui region:

- **Jurassic Tectono-Sedimentary Evolution:**
  The expansion of the High Atlas Basin during the Jurassic period facilitated widespread carbonate platform development, accompanied by synsedimentary intrusions and progressive unconformities associated with diapiric activity. This led to the formation of the Anergui structural ridge, also referred to as the "Anergui Unconformity" or "soupe diapirique."
- **Paleoenvironments** and Platform Development:
  The region preserves rich sedimentological and paleontological evidence tied to the evolution of Lower and Middle Jurassic carbonate platforms, offering insights into paleoenvironmental conditions of the Mesozoic Tethys margin.
- **Compressional Phases and Tertiary Deformation:**
  Cretaceous and Tertiary compressive episodes generated significant structural deformation within the Dogger carbonate cover. These include flexible folds and reverse faults ranging from decametric to hectometric scales, particularly concentrated around diapiric structures and fold terminations. The deformation patterns reflect repeated NNW–SSE-oriented compressional stresses associated with Atlas tectonics.
- **Quaternary Landscape Evolution:**
  More recent geomorphological processes during the Quaternary have shaped the valley through erosional dynamics, resulting in detrital alluvial deposits and distinctive weathering landforms. These include karstification of carbonate terrains (e.g., Ait Abdi), the formation of badlands in Triassic detrital rocks, and surface alteration of volcanic substrates.

Together, these processes have produced a rich array of geosites that are of both scientific and educational value. The Anergui Valley stands as a key sector within the M'Goun Geopark, supporting geoconservation, geotourism development, and public education efforts aligned with UNESCO Global Geopark.

EVALUATION AND CLASSIFICATION OF THE IMBABURA GEOPARK'S GEOLOGICAL HERITAGE GEOSITES ACCORDING TO THE ASGMI AND BRILHA METHODS

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Keywords: Imbabura UNESCO Global Geopark, geosites, Brilha method, ASGMI method, geological heritage

The Imbabura UNESCO Global Geopark (IUGGp), located in the northern highlands of Ecuador, stands out for its geological diversity and cultural richness. Its management is based on three fundamental pillars: education, geotourism, and conservation, which promote the geological, cultural, and natural heritage of the region to guarantee sustainable development. Since its creation, the identification of geosites has been based on the methodology of the Association of Ibero-American Geology and Mining Services (ASGMI). However, this methodology did not establish a clear distinction between places of geological interest and geosites, which generated inconsistencies in their categorization. Currently, the IUGGp has 12 official geosites, but there is no standardized procedure for their validation and updating according to the criteria of the UNESCO Global Geoparks Network.

To address this problem, this research aims to combine the methodologies of ASMIG and Brilha to reclassify geosites and generate possible georoutes, which will allow for analyzing the effectiveness of this methodology in the IUGGp. The proposed process comprises three phases:

(1) bibliographic review and comparative analysis of the proposed methodologies for the reclassification of geosites, (2) fieldwork for the collection of geological and tourism data, and
(3) application of the evaluation methods. In addition, strategic georoutes will be designed to improve the accessibility and promotion of geosites, promoting sustainable geotourism and territorial planning of the IUGGp.
It is expected that the results of this project will include a new classification of geosites for IUGGp, both as strategic and non-strategic georoutes, to optimize their management and use. In addition, it seeks to promote geotourism and the conservation of geological heritage in Northern Ecuador, promoting its appreciation and protection.

EXPLORING THE PALEONTOLOGICAL HERITAGE ON THE GEOTRAILS OF THE MIXTECA ALTA UNESCO GLOBAL GEOPARK (MEXICO)

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Keywords: geoheritage, geoparks, México, Mixteca Alta, geoconservation

Paleontological heritage includes fossils, remains and traces of organisms that lived in past times, together with the sites where they are located. These elements constitute a non-renewable resource of great scientific and cultural importance. This type of heritage, composed of movable and immovable property, is essential for the study and understanding of the evolution of life and the history of the planet.

Fossils and other paleontological evidence can be frequent geological elements in sedimentary basins, both marine and continental. The case of the Mixteca Alta UNESCO Global Geopark is no exception, considering that in its 415 km^2 territory, there are lithological remnants of Mesozoic (Tlaxiaco Basin) and Cenozoic (Yanhuitlán Basin) sedimentary basins. Although it is true that the Mixteca Alta Geopark has highlighted the presence of landscapes and intense erosion processes as its main characteristic, as well as the intimate relationship between the cosmovision of the local communities and the sustainable use of their geoheritage. However, in Mixteca Alta, fossil and traces remains emerge as an additional interest that requires attention and research.

In this sense, this paper brings up some actions carried out in the Mixteca Alta Geopark, aimed at disseminating and spreading the paleontological heritage present in this territory, through the collection of information on fossils and ichnofossils in rocks of Teposcolula (Cretaceous) and Yanhuitlán (Eocene) formations. Along the Yutoto and Las Conchas Geotrails, geological walks were conducted to observe fossils, and then systematize the findings, creating data tables with the main characteristics of the fossils and ichnofossils, as well as the corresponding photographic records, for identification to genus level; only 5% of the fossils inventoried, we were able to identified to species level. Among the main findings are crustacean burrows in continental basins, echinoderms, belemnites and bivalves (including some genera of rudists).

Finally, the information obtained was used for the creation of two field guides (one for each Geotrail): Guide to Fossil Invertebrates of the Yutoto Geotrail and Guide to Sedimentary Processes: Las Conchas Geotrail. These guides correspond to an informative material with graphic examples for easy understanding of the fossilization processes and characterization of the elements found in the geosites, as well as information of interest for each group and genus described. These guides are a complementary material that seeks to develop a better understanding of the geological processes that are visualized in the geosites.

THE HYDROGRAPHICAL BASINS OF THE KÜTRALKURA GEOPARK: A CAREFUL APPROACH TO TERRITORY THROUGH ARCHITECTURE

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Keywords: architecture, hydrographical basins, sustainable development, education, conservation

The hydrographical basins of the Kütralkura UNESCO Global Geopark traverse the mountainous terrain and articulate a depth of influence similar to that of its rivers, which flow through a main channel irrigated by side tributaries. This system of valleys constitutes the park's unique landscapes and ecosystems, intersected in turn by the bioceanic routes that cross Kütralkura and connect it to the rest of the continent and its human ecosystems.

This approach seems pertinent and even necessary, given the geography of much of Chile, which consists of a combination of transverse valleys and ravines containing rivers, lakes, and roads, all irrigated by small natural and human-made tributaries.

We applied this logic to address the landscape in the Practical Workshop of the School of Architecture of the Universidad Católica de Temuco. This presentation, in addition to introducing our proposal for understanding the Kütralkura Geopark through its basins, seeks to showcase some architectural projects developed during the workshop, which are the fruit of this particular point of view.

We propose a tour of Kütralkura through several simultaneous layers. First, we approach it from its representations, drawing contour lines and mapping the different levels of the territory, for example, its geological, botanical, or political layers. This initial process of remote observation allowed us to discern three scales, which we call: (1) territorial or basin scale; (2) local or sub-basin scale; and (3) immediate or human infrastructure scale.
We then traveled to the Geopark to directly observe these three layers. We toured, observed, and drew the basins, spoke with their inhabitants, and compared our remote analyses with reality. For fieldwork, we formed three groups, each assigned to one of three basins: those of the Allipén, Cautín and Biobío Rivers. The students identified the characteristic spatial conditions and geopolitical and geographic variations of each of these basins, then focused on a sub-basin, observed, and analyzed it. The next step was to identify a local problem, in order to focus on developing a pinpoint intervention on the local, immediate scale, through a project-based piece that would trigger the spatiality and life of that specific place.

Approaching the territory from this perspective allowed us to discover that the basins and sub-basins contained particular identities among their inhabitants, which must be considered when intervening with respect. The different layers of interpretation—of geology, glacial valleys, flora and fauna, human habitation, among others—generate a depth that invites us to really understand the place, and to propose, as architects, a holistic and pertinent contribution, with a careful eye toward its inhabitants. We thus propose a project that does not disintegrate, but unites; one that understands the global context as well as the particular ways of life. By taking advantage of the possibilities offered by the intersections between the local and the global, we outline strategies to achieve social, economic, and environmental sustainability that foster the harmonious and relevant development of our communities.

ADVANCES ON LANDSCAPE NAMING AND SCIENCE POPULARIZATION IN ZHANGJIAJIE UGGP OF CHINA

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Keywords: conservation, science, research

Zhangjiajie UNESCO Global Geopark (UGGp) is located in the western Hunan Province of China, with landscapes characterized mainly by more than 3000 sheer vertical sandstone pillars, peaks and walls of 30-350 m high. These spectacular features have made it the first national forest park of China in 1982, a UNESCO natural heritage site in 1992, and a member of Global Geopark Network in 2004. However, there has been no consensus of opinions on naming the outstanding landscapes due to the lack of detailed research work on their formative mechanisms and conditions.

Under the efforts of collaborative research among scientists at home and abroad, a series of research projects has been undertaken over the last 30 years. The results have demonstrated clearly the important roles of erosional processes of river flow and vertical joints widely developed in the thick layer of sandstone that formed in the Devonian period and contains more than 90% quartz. In light of the study results, a series of international academic exchange and science popularization activities have been conducted in Zhangjiajie UGGp and the name of Zhangjiajie Landscape was generally accepted. Consequently, the products of Research-Study-Tours have been made available in Zhangjiajie UGGp, which were built upon the characteristics and physical mechanisms underlying the development of the landscapes, in combination with the ecological environment and folk culture in Zhangjiajie UGGp. This presentation will provide a detailed introduction of the activities and the contributions of scientists on naming the outstanding landscapes.

NATURAL LABORATORY OF THE SOUTHERN ANDES OF CHILE: SCIENCE, TECHNOLOGY, KNOWLEDGE AND INNOVATION FOR THE DEVELOPMENT OF MOUNTAIN COMMUNITIES

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Keywords: Southern Andes of Chile, Natural Laboratory, Science-Technology-Knowledge-Innovation, Mountain Communities, sustainable development

Since 2022, the National Agency for Research and Development (ANID) of the Ministry of Science of Chile has proposed the establishment of Natural Laboratories (NL) in different contexts (desert, mountain, ocean, Antarctic, subantarctic, and salt flats), with the aim of becoming articulating nodes of the Science, Technology, Knowledge, and Innovation (STKI) ecosystem in the country. For ANID, NL correspond to territories with unique natural and/or cultural attributes, which present advantages and opportunities for scientific, technological, and knowledge development, with global impact and relevance for local development. In this institutional context, the Natural Laboratory of the Southern Andes of Chile has been selected in the mountain category. It comprises the Andean zone of the Araucania, Los Rios, and Los Lagos Regions (38o-44oS) with a total area of 52,891 km2 (www.andesdelsurlab.cl). This territory hosts 28 communes with numerous human settlements and ~690,000 inhabitants, representing the highest population density in the Andes nationwide. Different initiatives supported by UNESCO are: 1) the "Araucarias" and "Temperate and Rainforests of the Southern Andes" Biosphere Reserves; 2) the Kütralkura Global Geopark; and 3) a Nationally Important Agricultural Heritage System (SIPAN) recognized by the FAO. Additionally, the Patagonia Verde Geopark project is also promoted. This NL includes 21 public and 66 private protected areas, covering ~45% of the total area. It is home to the country's highest-risk volcanoes: Villarrica, Llaima, Calbuco, Puyehue-Cordon Caulle, Osorno, Mocho Choshuenco, Carran-Los Venados, Chaiten, and Lonquimay. More than 120 sites of geological interest have been identified and characterized, representing a geological history of ~400 million years linked to subduction and orogenic processes. A bibliometric analysis identified 937 scientific articles published between 1982 and 2023, demonstrating the global relevance of this region to research.

The Natural Laboratory of the Southern Andes of Chile aims to promote strategies that connect interdisciplinary scientific work with local stakeholders and communities, fostering innovation processes that contribute to sustainable territorial development and the well-being of their communities. The main topics addressed are: 1) understanding the geological evolution and its applications to reduce disaster risks and the potential productive uses; 2) the effects of natural and anthropogenic disturbances on vegetation, soils, and water resources; and 3) mountain sociocultural practices and the implementation of effective management models. Recent efforts to achieve the proposed objectives include the development of an Atlas of the Southern Andes of Chile that provides integrated geospatial information visualization, a traveling exhibition, a training program for key actors in mountain management and knowledge, the publication of a book, and an advocacy program in mountain territories.

ORIGIN OF GEOLOGICAL HERITAGE OF COMARCA MINERA GEOPARK: PRACTICAL NOTES ON THE VALORIZATION OF A TERRITORY THROUGH ITS GEOLOGICAL HERITAGE

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The Comarca Minera Geopark is situated in the State of Hidalgo and spans nine municipalities across an area of approximately 1,900 km². Each municipality holding 2 to 5 geosites, which may be of geological, natural, historical, scientific, academic, or cultural interest.

The geological processes that gave rise to the mining region include intense intrusive or extrusive magmatic activity. The former shaped extensive mineral deposits and intrusive igneous bodies, while the latter manifested itself explosively and effusively. Both occurred over several million years.

Explosive volcanic activity shaped the geological heritage in: Cerro de las Navajas with its fall deposits, obsidian flows, and lava flows. The Tezoantla Quarry was formed by a powerful eruption that produced light-colored ignimbrite deposits of rhyolitic composition. The Pyroclastic Deposits of Mineral del Chico and the Cubitos Geosite. The monogenetic volcanoes in the region, such as La Paila and the potential geosite Cerro del Tezontle, originated from more recent explosive volcanic activity with a lower explosivity index.

Effusive volcanic activity produced lava flows that gave rise to the Basaltic Prisms and the extensive lava flows that form the region's current plateaus, as well as the volcanic domes that dominate approximately 70% of the region's morphology.

The surfaces of volcanic domes and lava flows were exposed to intense physical and chemical weathering, which caused them to decompose, dissolve, erode, and fragment, giving rise to whimsical sculptural forms such as: El Guajolote, Peñas Cargadas, Peña el Comal, Peña del Aire, Peñas las Monjas, Peña el Diablo, Peñas las Ventanas, and Peña el Zumate.

The Comarca Minera is of exceptional beauty, shaped by majestic geological structures and the natural richness of the surrounding land, forming a landscape that captivates the senses and awakens the curiosity of those who visit.

GEOCONSERVATION STRATEGY AZORES UGGP: A LONG PATH OF OPPORTUNITIES AND CHALLENGES

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Keywords: geoconservation, geosites, geoheritage, georeferencing

The development of a comprehensive geoconservation strategy within the Azores UNESCO Global Geopark (UGGp) is the result of a long-term, multi-layered process grounded in continuous monitoring, scientific research, and the identification of new opportunities for the sustainable management and preservation of geological heritage. Central to this approach is the recognition that geosites serve diverse purposes—some are primarily of scientific interest, others require strict conservation measures, and only a subset are suitable for public use and visitation. As such, clearly defining the use of each geosite is a prerequisite for the implementation of effective conservation and valuing measures.

A key step in this ongoing effort has been the dynamic process of compilation, updating, and georeferencing geosites and Geopark data, a task essential to ensuring the accuracy, accessibility, and strategic value of the geosite inventory and of the Geopark strategy.

To operationalize this data and enhance decision-making, a Geographic Information System (GIS) platform is under continuous development. This tool integrates multiple layers of spatial information, including the 122 geosites, the regional network of protected and classified areas, hiking trails, interpretation and science centres, museums, partners, thematic geodiversity and geosites routes, (geo)urban routes, Geopark and partner signage with geodiversity content, infopoints and island delegations of the Geopark. The GIS system not only supports internal management but can be adapted to foster public engagement, serving students and educators, researchers, local communities, and visitors alike.

By enabling a territorial overview of the Geopark's presence across all nine islands, the GIS platform has become instrumental in identifying gaps—such as lack of signage or need for adjustments in geosite boundaries—and in proposing evidence-based adjustments. Furthermore, by cross-referencing geosite monitoring data with existing protection frameworks, it becomes possible to advocate for revised legal status of protection that better safeguard key geosites.

Ultimately, the success of this strategy relies on sustained collaboration with the Regional Government of the Azores, local stakeholders, and institutional partners, reinforcing the Geopark's role as a dynamic model for integrated geoconservation.

GEOHERITAGE SIGNIFICANCE OF THE NORTH RIYADH UNESCO GLOBAL GEOPARK, CENTRAL SAUDI ARABIA

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Keywords: geoheritage, geodiversity, Jurassic, Saudi Arabia, UNESCO Global Geoparks

The North Riyadh UNESCO Global Geopark (NRUGGp) designated in 2025 and spans 3,221 km² in central Saudi Arabia conserves 20 geosites of exceptional geological significance. This study aims to document and interpret the key geoheritage features of the NRUGGp. These include prominent escarpments, diverse structural features, a rich fossil record, and dynamic Quaternary landscapes. Notably, the geopark encompasses: (1) the Jurassic Tuwaiq Mountains, which contains extensive carbonate platforms rich in macrofossils and showcases exceptional reefal ecosystems, petroleum reservoir rocks, and organic-rich source rocks. These outcrops provide valuable surface analogues for subsurface hydrocarbon systems and include one of the most prolific Jurassic source rocks responsible for generating a significant portion of the petroleum in the Arabian Basin. They serve as (1) natural laboratories for studying the complete petroleum system, from shallow marine deposition to modern arid weathering processes; (2) extensive karst systems developed through differential weathering of resistant Jurassic limestone and softer argillaceous beds; and (3) active Neogene to Quaternary landforms, such as sand dunes, sabkhas, and oases. The NRUGGp integrates scientific research, geoeducation, and sustainable ecotourism, contributing to Saudi Vision 2030 through community-based conservation and geoscience outreach.

A HOLISTIC APPROACH TO GEOSITE CONSERVATION PLANNING FOR KHORAT UNESCO GLOBAL GEOPARK

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Keywords: Geosite-Level Management Plan, local community engagement, sustainable local development

The Khorat UNESCO Global Geopark is an area of rich geodiversity and biodiversity. Its geosites, scattered throughout the territory, are more than just scientific evidence; they are an integral part of the environment, history, and the community's way of life. This makes them highly valuable for research, education, lifelong learning, tourism, and economic development. For this reason, developing a holistic approach to geosite conservation is crucial for the effective management of the Khorat Geopark. This plan aims to establish clear guidelines for balancing the conservation and sustainable utilization of geological heritage. It emphasizes local community engagement and the integration of geological, ecological, and cultural heritage. The plan also prioritizes resource conservation and restoration, the protection of native plant species, and the promotion of local wisdom.

The process of developing the plan involved practical workshops held at four pilot sites. Over 120 participants from government agencies, the private sector, local community representatives, educational institutions, and other stakeholders joined forces. They brainstormed and developed geosite conservation plans that were appropriate to the context of each area. An evaluation showed that participants were satisfied with both the quality of the plan and the workshops, and their engagement was rated as very high.

Furthermore, the working group has integrated knowledge on the conservation and management of natural resources into all geosites. This ensures a comprehensive and effective conservation plan across all dimensions. These efforts are aligned with the Khorat Geopark management plan, local development plans, and related national plans, which is a key mechanism for driving sustainable development and a model for geosite conservation.

TRUNK MICROCLIMATE SHAPES EPIPHYTIC LICHEN FUNCTIONAL DIVERSITY ARAUCARIA ARAUCANA FORESTS ACROSS THE ANDEAN GRADIENT OF THE KÜTRALKURA UNESCO GLOBAL GEOPARK (MALALCAHUELLO, CHILE)

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Keywords: Epiphytic lichens, bioindicators, microclimate, thermal inversions, climate change

Epiphytic lichens are poikilohydric assemblages that track micrometeorological gradients at the bark–atmosphere interface and thus serve as bioindicators of ecosystem fragility to climate change. In *Araucaria araucana* forests (Malalcahuello, Kütralkura UNESCO Global Geopark), we conducted 50 censuses across four elevations (1390–1610 m) and two trunk aspects (north/south). Using eight iButtons (north and south per site), we derived daily means ±SE, daily thermal amplitude (monthly means), the north–south temperature difference (ΔT(N–S)), and the monthly lapse rate (°C/100 m). The 1560 m site was a thermal hotspot (amplitude ≈22.8°C); in May, the 1560–1390 contrast reached Δ=+8.37 °C (Holm-corrected $p<0.05$). The 1610 m site was thermally stable (amplitude ≈9.2 °C) but lacked cyanolichens, suggesting limitation by liquid-water frequency, wind exposure, and irradiance. ΔT_(N–S) favored the north face at 1390 and 1560 m (≈+2.7 °C), was ~0 at 1610 m, and negative at 1440 m (≈−0.65 °C). Monthly lapse rates were positive (+0.32 to +2.73 °C/100 m), consistent with local thermal inversions and the dominant role of exposure. Communities mirrored these filters: cyanolichens concentrated on south aspects at low elevation; fruticose lichens dominated by *Usnea* s.l on north aspects at high elevation; and foliose chlorolichens occupied intermediate niches (north/low, south/high). We recommend mapping microrefugia and designating sentinel trees at geosites with recurring positive lapse to support adaptive monitoring in Kütralkura.

LANZAROTE AND CHINIJO ISLANDS UNESCO GLOBAL GEOPARK, MARS ON EARTH

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Keywords: planetary analogs, Mars, habitability, geotourism

Mars research is based on three fundamental pillars aimed at characterizing the planet, understanding its habitability, and searching for possible forms of life. These pillars are:

1. **Characterization of Martian meteorites**: The study of meteorites from Mars allows for a better understanding of the planet's composition and evolution, as well as possible signs of life.
2. **Space missions to Mars**: Sending missions to Mars is crucial to studying its geology, climate, atmosphere, and potential resources, in addition to searching for evidence of life.
3. **Identification and characterization of planetary analogs**: Finding places on Earth with similar characteristics to Mars (such as volcanic or desert landscapes) makes it possible to conduct tests and experiments that help us better understand the Red Planet and design more effective exploration strategies.

In this third area, our Geopark has been recognized as a planetary analog—an essential resource for understanding the processes that occur on other planets and moons. The study of these analogs provides a scientific foundation for planetary exploration missions, while space missions, in turn, offer new data for the continued study of these planetary analogs.
On our planet, there are planetary analogs in various regions, such as Antarctica, the Arctic, Australia, and the Atacama Desert (Chile). **The UNESCO Global Geopark of Lanzarote and Chinijo Archipelago** has become one of the world's leading references in the study of planetary analogs.

Planetary geology and astrobiology are essential areas for understanding the possible existence of life on other planets, and the study of volcanism in the solar system is a key element in this analysis.

The UNESCO Global Geopark of Lanzarote has become a natural laboratory for Mars exploration. This geopark is not only a training ground for astronauts from the European Space Agency (ESA), but also a scientific model for habitability in future space missions.

One area of particular interest within the geopark is the study of lava tubes, both from a microbial perspective and as potential shelters for future semi-permanent bases on Mars or the Moon.

All of these studies and scientific initiatives are a valuable source of knowledge that should be shared with our visitors. In this regard, one of the sections of the newly inaugurated Casa de los Volcanes and Geopark Museum is dedicated to this fascinating field of research. The goal is to spark curiosity in visitors and encourage them to learn more about our geopark's contribution to science.
The following topics are featured using the latest technology:

- **ESA and Lanzarote**: A Natural Laboratory for Space Exploration
- **Planetary Analogs**: an interactive experience where visitors compare images of Mars and Lanzarote
- **Mission to Mars**: An Immersive Experience.

EARLY TO MIDDLE MIOCENE LONQUIMAY PALAEO-LAKE EVOLUTION AS RESULT OF CLIMATE FLUCTUATION

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Keywords: Lonquimay, Miocene, Palaeolake, palaeoclimate

At the Lonquimay Commune, La Araucanía Region of Chile, which is part of the Kütralkura Geopark, there are widely distributed lacustrine, delta, fluvial to alluvial sedimentary sequences of early to middle Miocene age (broadly from 16 to 13 Ma). Specifically at the locality of Río Pedregoso – Quilmahue, a lower section has been described and age constrained to younger than 16.5 Ma with radiometric dating of detrital zircons. The upper part of the sequence also is limited to no older than 12.7 Ma but at the El Cajon Sector with the same method (detrital zircons).

In this work we use detailed sedimentological data of a lower 50 m thick section close to Quilmahue, to apply facies analysis and sequence stratigraphy to address the paleo lake water level behavior.

Sedimentology, rock geochemistry and facies analysis show a rhythmic fluctuation from deep lacustrine environments to delta environments and in a minor frequency to fluvial environments. The sequence architecture reveals high state of water level (associated to a more humid climatic conditions) and low state of water level (related to drier climatic conditions).

We hypothesize that hydro availability is strongly dependent to cold conditions and to ice accumulation in the surrounding Miocene mountains, and we use this premise to discuss a preliminary correlation with the global oxygen isotope curve.

STRENGTHENING LEGAL PROTECTIONS: PROCEDURAL PROPOSALS FOR ENVIRONMENTAL DEFENDERS FACING SLAPPS

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Keywords: public awareness, Ombudsman, due process, interpretation and communication

Hypothesis: The implementation of specific procedural mechanisms, would constitute a relevant and effective set of measures to counteract SLAPP litigation.

1. Environmental defenders' work has been the object of persecution and criminalization aimed at censorship. Among these acts of persecution are SLAPPs (Strategic Lawsuits Against Public Participation), which target individuals for their work of public denunciation and awareness-raising regarding environmental issues. Rather than aiming to win the case, SLAPPs are used to burden the defendant with legal costs, consume their time and energy, and deter both them and others from future participation or public criticism.
2. In the case of Chilean environmental defenders, given their general belonging to Indigenous peoples who hold the land at the center of their cosmovision, these actions, in addition to affecting their freedom of expression in defense of the environment, impact other fundamental guarantees such as their freedom of conscience and their right to the protection of their spiritual and religious practices.
3. In the case of environmental defenders, their weakness also lies in the fact that their counterparts are large corporations with economic means that disrupt the necessary procedural equality, understood as equality of arms. Therefore, it is also a requirement derived from due process to strive for procedural equality between the parties.
4. The Chilean legal system already contemplates mechanisms for the judicial defense of vulnerable subjects, such as public defenders for absent persons, judicial prosecutors, legal aid corporations, duty attorneys, public and labor criminal defense, and *curator ad litem*. These existing mechanisms aim to equalize the procedural situation of the parties given the vulnerability of one of them.
5. **Conclusion:** Given their procedural vulnerability, it is necessary to rectify the imbalance through specific procedural mechanisms, such as entrusting their defense to a state body, granting environmental defenders the privilege of poverty (legal aid), or establishing a category of costs for litigation considered SLAPP (costs based on the economic burden on the state to defend the cause).
6. **Methodology**: This proposal employs a mixed-method approach, combining **theoretical-conceptual analysis** (procedural/constitutional vulnerability, "equality of arms," Indigenous cosmovisions against SLAPPs) with **comparative legal analysis** (successful anti-SLAPP measures, e.g., environmental ombudsman, legal aid, cost mechanisms). Findings will inform proposed procedural mechanisms tailored to the Chilean legal context for effective SLAPP defense and environmental justice.

DIVERSITY OF NATIVE BIRDS IN LOCALITIES OF THE KÜTRALKURA GEOPARK IN SOUTHERN CHILE

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Keywords: Kütralkura Geopark, bird diversity

The natural heritage of a place includes the habitats of native fauna species, the ecological processes that involve them, and the wilderness areas that protect them. The objectives of this study are: (a) to analyze the biological diversity of native birds in Kütralkura Geopark, Chile's first UNESCO Global Geopark. (b) to evaluate the value of the bird assemblage's taxonomic, functional, and phylogenetic diversity in geopark locations. The research was conducted in 11 geopark locations in the municipalities of Cunco and Melipeuco in southern Chile. Information from eBird was used over 10 years (2014 to 2024). We identified 3,354 valid bird records of 121 native and three exotic species, classified into 18 orders and 37 genera. Beta diversity is high, and five groups are identified as not associated with environment types (lake/lagoon/river and trail), with one group represented by Lakes Caburgua, Cólico, and Captrén and Conguillío lagoons, along with the Sierra Nevada and Santa María de Llaima sites with 55% similarity. Sites such as Sollipulli National Park, Melipeuco-escorial, and Río Blanco represented separate groups with less similarity to the rest of the areas (<40%). No significant differences were recorded between environments. Sixteen bird species accounted for 50% of the differences between environments, with *Fulica armillata* (8%), *Enicognathus ferrugineus* (6%), and *Chloephaga poliocephala* (4%) being the most significant contributors to the dissimilarity between environments. Functional diversity shows many guilds, most of which are specialists. Regarding phylogenetic diversity, the taxonomic distinctiveness of two localities has a value above what was expected (Delta + 75 units): these are Conguillío National Park - Conguillío Lagoon (Delta + 75.46 units) and Río Blanco - Caburgua Lake mouth (Delta + 75.48 units). This analysis of bird diversity in the geopark is discussed within the framework of its ecological value and relevance for the Kütralkura Geopark.

TOGETHER FOR JEJU, CONNECTED WITH THE WORLD: A NEW MODEL OF PUBLIC–PRIVATE PARTNERSHIP FOR GEOPARK CONSERVATION AND SDGS IMPLEMENTATION

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Keywords: Public–Private Partnership (PPP), SDGs, geoconservation, Jeju, ESG Engagement

Designated as a UNESCO Global Geopark in 2010, Jeju Island has successfully maintained its status through three revalidations. The Jeju Global Geopark has been sustainably managed through strong collaboration with local communities, particularly around its representative geosites. Initiatives such as geo-trail-based local festivals, the development of geo-food products, partnerships with small businesses, and educational programs for both residents and future generations have laid the foundation for a robust community-based conservation model. Until recently, these efforts primarily involved cooperation between local residents and government agencies. However, in 2025, the active inclusion of the private sector marked a turning point, evolving Jeju's approach into a broader, multi-stakeholder partnership model. Jeju Global Geopark now serves as a practical example of a public–private partnership that supports the goals of inclusive, sustainable management.

As an island with extensive coastal zones, Jeju has been intensifying its implementation of Sustainable Development Goal (SDG) 14: Life Below Water. Marine debris carried by seasonal winds and ocean currents is increasingly polluting the island's coastlines, posing a direct threat to both geological heritage and ecosystem health. In response, Jeju Global Geopark organized a large-scale environmental campaign on April 17, 2025, coinciding with Earth Day and the 6th APGN WEEK, at Suwolbong, one of its representative geosites.

The campaign, which launched a long-term coastal cleanup initiative, featured a plogging activity (picking up trash while jogging) and brought together over 250 participants, including local residents, geopark Interpreters, government staff, volunteers from diverse backgrounds, and international members of a global private company. While their cultural perspectives and understanding of geoheritage varied, they shared a common goal of conservation through action. This campaign highlighted the role of the Geopark as a platform for ESG-driven corporate participation and demonstrated how Geoparks can connect local action with global citizenship. On-site interpretation by Geopark guides further strengthened public awareness of the geological and conservation value of Suwolbong. The initiative received positive coverage from local media and was recognized as a leading case of Jeju's localized yet globally aligned SDG practices.

Jeju Global Geopark will continue to develop inclusive, action-oriented programs that foster collaboration among stakeholders across sectors, further strengthening the conservation of geological heritage and promoting environmental awareness at both local and global scales.

HYDROGEOTHERMAL POTENTIAL SPRINGS OF ZAGHOUAN GEOPARK IN TUNISIA

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Keywords: Hydrogeothermal, Spring, Zaghouan Geopark

Establishment of a scientific approach based on the exploitation of integrated surface and subsurface data for the characterization of underground aquifers in semi-arid regions. Such an approach will find application in most sedimentary basins in, Tunisia or elsewhere.

Detailed geological mapping and hydrogeological and geophysical and geochemical surveys will be carried out in order to evaluate the geothermal potential of the Zaghouan area, and to construct a conceptual geothermal model of the hydrothermal system. The aim is to introduce the synthetic geothermal approach in the integration of the main hydrogeothermal indicators in the area and so demonstrate its potential as a platform for regional studies and therefore assist in the discovery of new geothermal prospects.

This results are part of the project "Hydrogeological significance of Mediterranean Geoparks (IGCP-730)" funded by UNESCO's Geological Sciences Program, which plays an important role in the conservation of the geoheritage due to their scientific and touristic interest

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This project will contribution to the economic and social development of the Zaghouan region by finding new underground water resources for agricultural and drinking water needs, support for tourism and agricultural investment programs underway in the region and Implementation of a health tourism center (new Spa), opportunity for geotourism development.

MONITORING GEOCONSERVATION STATE OF KARST SYSTEMS IN NAPO SUMACO UNESCO GLOBAL GEOPARK (ECUADOR)

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Keywords: geoheritage, geoconservation, Karst, Caves, Napo Sumaco

Karst is a landform characteristic of the dissolution of carbonate rocks, commonly associated with intense water activity. Thanks to the variety of resources and services it offers, and its widespread presence in different parts of the world, it has been an essential source of supply for mankind. However, its value also makes it susceptible to threats and changes. In addition, karst systems offer a wide variety of resources with multiple applications, for example, many caves have been exploited as tourist destinations due to their natural and cultural value, with tourism being one of the main forms of social and economic exploitation of karst, due these geological formations encapsulate histories, interactions and evidence of past natural processes. These conditions have generated that the study and evaluation of the conservation status of karst systems is a topic of great interest, and due to the multidisciplinary nature of karst, studies have been developed that address the conservation of fauna, water resources, cultural heritage, landscape and protected areas, all this through the application of qualitative indices.

In this scope, the following work was developed to monitor the conservation status of some sites within the karst systems that are part of the territory of the Napo Sumaco UNESCO Global Geopark, through the application of the Karst Disturbance Index (KDI), which consists of a series of numerical matrices, applied to the observation sites. It was determined that the levels of disturbance are relatively low, which is consistent with the evolutionary state of the karst in the areas studied, classified as young and juvenile. Currently, karst degradation is limited, but it is suggested that specific conservation strategies be implemented in the future. These measures would be key to strengthen the protection of the karst from tourism activities, which are constantly developed in the karst sites of geopark area.

This study sets a precedent at the national level, due it evaluates the state of conservation of karst through qualitative matrix analysis, and in Ecuador there are no previous records of the application of this process. In general terms, the study of karst is still an unexplored field at the national level. In addition, the identification of the main pressure factors on karst resources can serve as a key tool in decision making, both within the Napo Sumaco Geopark and in the Amazonian municipalities of Ecuador.



GEOPARKS, SUSTAINABLE LOCAL DEVELOPMENT AND GEOTOURISM

GADEX LABORATORY: SUSTAINABLE DEVELOPMENT THROUGH BIODIVERSITY ENHANCEMENT AND INNOVATION IN THE PROCESSING AND MARKETING OF LOCAL PRODUCTS

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Keywords: sustainable development, bioeconomy, agricultural sector, biodiversity

Las Loras UNESCO Global Geopark, located in the Cantabrian Mountains (Burgos-Palencia, Spain), houses numerous treasures that make up its exceptional natural, historical, and cultural heritage.
The attention of visitors to the Geopark is immediately drawn to the powerful impact and natural beauty of its landscapes. Fertile valleys, deep canyons eroded by rivers, rock labyrinths, beech and oak forests and numerous crystalline waterfalls situated between high moorlands represent one of the most diverse environments and areas in Northern Spain. Geological characteristics have defined and conditioned the land uses that humans have made throughout history. In this sense, this region has been an excellent area for farming and family livestock raising since the Neolithic period.

However, the current crisis affecting the agricultural sector has led to a clear decline in agricultural and livestock activity. This has resulted in a significant population decline, due to a reduction in the number of families engaged in farming and livestock raising, as well as environmental problems and a loss of adaptability to climate change due to the intensification of agricultural operations.

For this reason, a change in the production and marketing models of products is necessary, highlighting both their high quality and the socio-environmental benefits generated by extensive livestock farming. This includes implementing measures that promote short marketing channels, while also involving the local population and Geopark visitors so that they are aware of the importance of local produce. For this reason, we have launched the "GAD-EX Laboratory" project, supported by the Biodiversity Foundation of the Ministry for Ecological Transition and the Demographic Challenge (MITECO) within the framework of the Recovery, Transformation, and Resilience Plan (PRTR), funded by the European Union – NextGenerationEU.

GAD-EX Laboratory is developing eleven actions to promote the agricultural sector in general and extensive livestock farming in particular as a tool for fostering biodiversity and the bioeconomy by improving the commercialization of local livestock resources and combating rural depopulation in the Las Loras Geopark.
The project's various actions, such as improving forest areas for livestock farming through selective clearing, using goats to thin scrubland, installing green hedges to promote biodiversity, restoring extensive livestock infrastructure (green fences and watering troughs), and so on, aim to optimize the use of natural resources. There are also actions related to the use of new technologies to analyse the evolution of biodiversity in pasture areas to improve their management, or the accounting of ecosystem services linked to livestock farming, which aim to provide tools to improve farm profitability.

Finally, one of the most important actions will be to improve the production and marketing of products derived from extensive livestock farming, beekeeping, and local sustainable agriculture through the implementation of a meat processing plant, a food processing center, and a distribution and storage center for local produce.

A NEW GEOPARK TRAINING DAY IN LANDERNEAU CITY CENTRE

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Keywords: education, sustainable tourism, professional training, geoheritage

On April 3, 2025, Geopark Armorique organized a training day titled “Geology and Heritage” in the historic center of Landerneau. This initiative aimed to deepen participants' understanding of the geological significance and heritage value of the region’s urban and natural landscapes.

The event was part of Geopark Armorique’s annual training program for tourism professionals, heritage guides, and other local actors engaged in geotourism. The goal is to equip them with solid scientific knowledge and interpretive tools to enhance visitor experiences, in connection with the territory’s designation as a UNESCO Global Geopark in 2024.
In Landerneau’s town center, participants explored rock outcrops, stone façades, and infrastructure reflecting the area’s geological history and long-standing relationship between stone and society. Led by a geologist and a landscaper, the sessions combined field observation, presentations, and group discussions. Key topics included lithology, structural geology, and the traditional use of local materials—laying the groundwork for scientifically grounded narratives in guided tours and interpretive signage.

The training also encouraged dialogue between geologists, guides, and educators, allowing participants to share experiences, compare interpretive approaches, and reflect on public engagement strategies. Feedback highlighted the need for more accessible educational tools and site-specific resources tailored to local contexts.

Crucially, the session introduced participants to the educational materials developed within the Geopark Armorique framework. These tools are especially valuable for nature guides who are less familiar with geosciences. The training helped them gain confidence in using these resources to incorporate geohistorical insights into their nature walks. By simplifying complex concepts and offering practical support, the Geopark helps overcome the perceived difficulty of mediating geoscientific content, encouraging broader integration of geoheritage in environmental interpretation.

Practically, the training improved understanding of regional lithological diversity (granite, schist, sandstone) and its influence on local building traditions. It reinforced geology’s role as a narrative thread connecting natural processes, cultural identity, and landscape evolution.
This event exemplifies Geopark Armorique’s commitment to sustainable tourism and geo-education. By training those who interact directly with the public—guides, mediators, educators—the Geopark enhances the quality and coherence of territorial storytelling. The initiative aligns with global Geopark goals: strengthening local capacities, promoting responsible heritage interpretation, and supporting local development through science-based narratives.

In conclusion, the April 3 training in Landerneau demonstrated how scientific knowledge empowers local actors to interpret and promote geological heritage. By blending fieldwork, interdisciplinary exchange, and resource familiarization, Geopark Armorique fosters professional growth, enriches visitor experiences, and strengthens the link between Earth history and human heritage in urban settings.

DANUBE GEOTOUR PLUS

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Keywords: sustainable tourism, GeoExperience, Innovative Visitor Counting

The Interreg **Danube GeoTour Plus** project (2024–2026) is about boosting opportunities for more inclusive, valuable, and balanced Geopark Communities. It advances balanced visitor management across nine geoparks in the Danube Region, focusing on open routes, hot spots, and larger territories. Under Special Objective 3.3, the project develops and tests practical, cost efficient solutions to monitor and guide visitor flows.

9 (UNESCO) Global Geoparks are testing commercial infrared counters, wildlife cameras, and mobile data tools to assess the most effective technologies. A key pilot in Bükk Geopark (Hungary) focuses on open routes, where a custom-built, solar-powered sensor prototype is being tested. Using PIR and camera-based detection, it provides real-time, GDPR-compliant data at low cost.

Alongside hardware, the project is developing a joint mobile app and digital platform to show live visitor numbers, show visitor peaks, and basic maximum carrying capacities, supporting real time visitor guidance and long-term planning.

Local communities, especially vulnerable groups, are actively involved. Their engagement strengthens inclusive governance and supports the creation of more inclusive, resilient geopark communities.

Danube GeoTour Plus offers a scalable, cooperative model for sustainable tourism and conservation in protected geopark areas.

GEOPARKS AND MASS TOURISM

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Keywords: geoparks, sustainable local development and geotourism

Work on establishing the Katla Geopark started in 2008. At that time, the local economy in the area was in a downward spiral, population was diminishing, the young people moved out of the area and the remaining population was getting older, businesses were closing and services were deteriorating.

All the 14 municipalities in South Iceland formed a company in 2007 aimed at improving access to tertiary education in the area, encouraging research and science, and regional development. The Board decided to focus their initial efforts on the three easternmost municipalities where the economic situation was most severe – these later became the territory of Katla Geopark.

A geologist, Lovísa Ásbjörnsdóttir, who had attended a European Geopark Conference in Naturtejo Geopark in Portugal, introduced the geopark concept to the Board and subsequently Patrick McKeever, EGN Vice Coordinator, was invited to the territory and attended public meetings in the territory to discuss the opportunities for regional development via the geopark concept.

Katla Geopark was subsequently formed in November 2010, an application was made to become a member of the EGN and GGN networks, and at the EGN Conference in Gea Norvegica Geopark in Norway in September 2011 the application was approved.

The focus of the project in the beginning was more on regional development than geoconservation. In an interview in 2011 I stated that the vision for the geopark was to increase the number of all-year-round jobs in tourism in the territory, as tourism was generally a summer activity at the time.

In 2008 the estimated total number of visitors to Iceland were just under 500.000, but now it is about 2,3 million. In Reynisfjara (Black Sand Beach) the banks were reluctant to finance the first facility (restaurant and toilets) in 2013, but now about half a million visitors visit it annually. The total number of inhabitants in the Katla Geopark territory was about 2.700 in 2008, but in 2024 it was about 3.700, an increase of about 37%.

In the presentation an attempt will be made to assess the effects of this dramatic increase, both on society and geoheritage.

ENHANCING VISITOR EXPERIENCE THROUGH LOCAL GEOPARK GUIDES

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Keywords: tourism, education, experiences

The Troodos Geopark has taken a significant step in enhancing visitor experiences by establishing a program to train and certify 10 local guides. This initiative aligns with the geopark's mission by offering guided tours led by individuals who live within the geopark, thus ensuring authentic and knowledgeable experiences for visitors. Additionally, this program supports local communities by providing an alternative source of income and encouraging residents to remain in rural areas.

The selection of guides was carried out through an application process, with the top 10 candidates chosen based on their scores. The training program consisted of 40 hours of instruction, designed in collaboration with experts who adapted a UIAA-certified program to Cyprus' specific needs. Additional training was provided by the Cyprus Ministry of Forests and the Department of Geological Survey, ensuring a comprehensive foundation in navigation, problem-solving, geology, ecology, culture, and communication.

The primary beneficiaries of this initiative are young individuals with a passion for nature and an interest in pursuing careers in alternative tourism. The program was made accessible by securing funding to offer it free of charge, thus lowering financial barriers for participants. Each trained guide brings their own specialization, whether geology, hiking, wine, or cultural heritage—allowing for a diverse range of experiences that cater to different visitor interests.

The introduction of local guides has received positive feedback, with visitors appreciating the opportunity to engage with locals and gain deeper insights into the geopark's natural and cultural heritage. This initiative has not only improved visitor satisfaction but also strengthened the local tourism sector. Moving forward, the Geopark aims to introduce weekly tours led by different guides, further enhancing the variety and accessibility of guided experiences within the area.

By integrating trained local guides into the visitor experience, the Troodos Geopark has successfully enriched its tourism offerings while fostering economic and social sustainability in rural Cyprus. This initiative serves as a model for leveraging local expertise to promote responsible and immersive tourism experiences within geoparks worldwide.

EUROPEAN FUNDED PROJECTS AND THEIR IMPACT ON THE TROODOS UNESCO GLOBAL GEOPARK (TUGG)

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Keywords: EU Projects, education, tourism, SDG's

The Troodos UNESCO Global Geopark has benefited greatly from European Funded Projects, with over 10 projects implemented since 2011. These projects, funded through various EU programs like Interreg Greece/Cyprus, Interreg Mediterranean, Horizon, LIFE, and Leader, have been used to develop educational tools and applications. Additionally, these funds have been used for renovating the visitor center, creating nature trails, developing educational materials, and implementing sustainable development solutions.

These projects have not only been a source of funding but have also fostered a sense of collaboration among Geoparks, particularly with Greek Geoparks, which has facilitated the exchange of ideas and best practices. This collaborative approach has strengthened the overall management of the Geopark, contributing to a more enriching visitor experience.

Furthermore, participation in European funded projects has positioned Troodos Geopark as a regional leader in sustainable tourism and geoconservation. The successful implementation of these projects has demonstrated the Geopark's commitment to innovation and its ability to leverage European funding for the benefit of the local community and the environment. This active participation in EU initiatives has also increased the Geopark's visibility on a European and global scale, attracting more visitors and researchers to the area.

European project proposals are drafted each year based on the recommendations of the evaluators for the re-evaluation of our Geopark. After each re-evaluation for the next four years, we try to build a strategy based on the recommendations, in addition to trying to predict areas where we are lacking or need improvement.

INTEGRATING NATURE CONSERVATION INTO SUSTAINABLE TOURISM IN THE CLASSICAL KARST: OUTCOMES FROM THE KRAS-CARSO II CROSS-BORDER PROJECT

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Keywords: Nature conservation, guidelines, geotourism

The KRAS-CARSO II project is a three-year EU Interreg Italy–Slovenia initiative focused on enhancing the role of natural and cultural heritage in sustainable tourism, regional development, and social innovation across the transboundary Classical Karst (Kras/Carso) region. An important goal of the project is also the establishment of a management structure for the cross-border geopark Kras - Carso.
The Institute of the Republic of Slovenia for Nature Conservation (IRSNC), as a project partner, led two key components:

- developing expert guidelines for managers of natural and cave sites, and
- organizing educational workshops for cavers and cave managers in both countries.

As part of the environmental strand of the project, IRSNC and its partners conducted two scientific studies. The first, Assessment of the State of Protected Natural Areas and Tourism Use, identified areas within the geopark experiencing the highest visitor pressure from activities such as hiking, cycling, climbing, horseback riding, and caving. The most affected areas were the Karst Edge (from Duino/Devin to Opicina/Opčine), Lipica, the Škocjan Caves Regional Park, Vremščica, Slavnik, and the Val Rosandra/Glinščica Valley. The second study, Carrying Capacity of Nature for Selected Geolocations, applied the newly developed methodologies for assessing the ecological carrying capacityin selected show caves and nature reserves. The study also provided practical guidelines for the sustainable management of visitor flows in ecologically sensitive karst environments.Addressing the social dimension of sustainable tourism, IRSNC organized two cross-border workshops for cavers and cave managers. The first, held at the Škocjan Caves (Slovenia), presented joint cave management strategies and explored legal and scientific frameworks for cave protection in both countries. The program included lectures on karst geology, geodiversity and biodiversity legislation, and case studies from Škocjan Caves (Slovenia) and Grotta Gigante /Briškovska jama cave (Italy). The workshop concluded with a field visit and the collaborative drafting of joint cave management guidelines. The second workshop, hosted at Grotta Gigante focused on the issue of **lampenflora** – the growth of predominantly phototrophic organisms near artificial light sources in caves. These photosynthetic organisms, present significant ecological challenges to subterranean environments. The program included lectures on international cave protection standards, the causes, impacts, and control of lampenflora, and featured case studies from Škocjan Caves and Grotta Gigante. Experts presented lighting adaptation strategies and monitoring practices, followed by a guided tour of Grotta Gigante, where ecological monitoring techniques were demonstrated, including light and temperature measurements and identification of lampenflora types under varying environmental conditions. Extended through August 2026, the KRAS-CARSO II project offers a replicable, science-based model for integrating nature conservation into tourism development. It provides valuable tools and strategies for balancing nature protection with visitor engagement and serves as a reference for other karst regions and geoparks.

GEOPARK DAY: ENGAGING COMMUNITIES AND VISITORS WITH THE GEOHERITAGE OF MAESTRAZGO UGGP (TERUAL, SPAIN)

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Keywords: Geopark-day, geoheritage, Maestrazgo UGGp, Sustainable-Local-Development

Since 2017, the Maestrazgo UNESCO Global Geopark (UGGp), located in Spain, has organized the annual "**Geopark Day**"—a free event open to audiences of all ages. The initiative aims to raise public awareness of the region's geoheritage and its interconnections with various dimensions of natural, cultural, and intangible heritage, emphasizing their role as a foundation for sustainable local socio-economic development.

Geopark Day is held in some of the least populated municipalities within the Maestrazgo UGGp, including locations with fewer than 20 inhabitants and a population density below three inhabitants per square kilometer. Under the motto: "***Small, sparsely populated areas with a great heritage***", each edition of the event highlights a geosite of geological interest. These events not only offer an opportunity to explore the geological past, but also to reflect on the connections between geoheritage, the natural environment, and local cultural and traditional expressions.

This activity has become a landmark annual event, attracting both local residents and visitors with an interest in geoheritage, and contributing to the development of sustainable tourism initiatives. It is conceived as a festive occasion that includes traditional folk music, educational workshops, sports activities, and regional gastronomy, thereby fostering community engagement and cultural transmission. The Participants-to-Resident (P/R) ratio for the activity over the first six years ranges from 0.75 to 4.23, with an average of 2.4. This indicator reflects the level of interest in the Geopark's heritage and its capacity to mobilize participation beyond the local population:

2017. Montoro de Mezquita (Villarluengo): 13 inhabitants (Spanish National Statistics Institute 2024, SNSI-2024)/55 participants (Tectonic and structural geology, Archaeology, Paleontology). 2018. Ladruñán (Castellote): 40 inhabitants (SNSI-2024)/100 participants (Natural Monument, Geomorphology, Archaeology).
2019. La Zoma: 27 inhabitants (SNSI-2024)/110 participants (Mineralogy and metallogeny, Archaeology, Botany).
2023. La Ginebrosa: 196 inhabitants (SNSI-2024)/150 participants (Geomorphology, Geohazards, Botany).
2024. Cuevas de Almudén: 126 inhabitants (SNSI-2024)/200 participants (Hidrogeology, Geomorphology, Paleontology, Archaeology).
2025. Crivillén: 88 inhabitants (SNSI-2024)/120 participants (Mineralogy and metallogeny, Paleontology, Stratigraphy, History).

Overall, "Geopark Day" has consolidated its role as an annual initiative that facilitates the valorization of geoheritage among multiple stakeholders, enhances social cohesion in sparsely populated rural areas, and supports the development of sustainable tourism strategies—factors that are essential for the integrated and long-term development of the Maestrazgo UNESCO Global Geopark.

CIRCULAR ECONOMY: AGRICULTURE AND GASTRONOMY IN THE MIXTECA ALTA UNESCO GLOBAL GEOPARK

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Keywords: cultural heritage, sustainability, food

Circular economy proposes a production and consumption model that extends the lifespan of resources, minimizes waste, and regenerates natural systems. While it has been widely applied in industrial contexts, this approach can also emerge indirectly in rural territories through sustainable agri-food practices. In the Mixteca Alta UNESCO Global Geopark, located in Oaxaca, Mexico, the relationships between traditional agriculture, local gastronomy, and community-based commerce reveal a circular system deeply rooted in the biocultural heritage of the region.

This study is based on a review of specialized literature on circular economy, food sovereignty, and geodiversity in the Mixteca Alta, complemented by participant observation in agricultural processes, community fairs, and gastronomic workshops held in several localities within the Geopark. This study enabled the identification of how territorial dynamics align with circularity principles from seed to table.

Techniques such as lamabordos (stone terraces) and the milpa system not only ensure ecological sustainability but also generate food surpluses that are marketed in local tianguis (open-air markets). In these spaces, producers sell their harvests such as maíz, beans, quelites, native chili peppers, or squash directly to traditional cooks, vendors, and local consumers, without intermediaries or industrial packaging. This shortens supply chains and reduces the use of external resources.

The regional cuisine is primarily based on seasonal and locally sourced ingredients, adhering to agricultural calendars and local climatic conditions. This encourages a resilient and adaptable culinary tradition with a low ecological footprint that maintains a direct relationship with the surrounding environment. The food cycle is completed when organic waste, such as peels or kitchen scraps, is returned to the soil through traditional composting or animal feeding practices. In this way, food returns to the earth, and the system's fertility is preserved.
These agro-gastronomic dynamics sustain a circular economy rooted in the relocalization of food systems. The strengthening of local tianguis, the revalorization of peasant labor, and the conscious consumption of local products generate income, reduce dependence on industrialized foods, and consolidate the cultural identity of communities.
In the Mixteca Alta Geopark, the circular economy is not imposed as an external model, but rather emerges from the everyday practices of the countryside and the kitchen. The food cycle from land to table and back to soil represents a living form of circularity based on local knowledge, agricultural biodiversity, and community organization. This model strengthens food sovereignty, energizes rural economies, and reaffirms the deep connection between people, their

culture, and their landscape.

CONNECTING LAYERS: MAKING INVISIBLE GEOLOGY TANGIBLE IN A DENSELY POPULATED CROSS-BOARDER GEOPARK

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Keywords: invisible geology, connection, interactive experience map, multi-thematic storytelling

How do you connect 132 partners, 40 geosites, 57 municipalities, 5 provinces, and 2 countries into one coherent Geopark experience—especially in a region where geology is mostly invisible?

Geopark Schelde Delta lies in one of the most densely populated regions of Northwestern Europe. Its geology, largely hidden beneath the surface, is shaped by millennia of coastal and riverine processes that continue to this day. Unlike mountain ranges or rock formations, our landscape tells its geological story in subtle, layered ways—through tidal rhythms, sedimentation, and human interaction with land and water.

This paper explores how we foster connection across such a complex territory by using geology as a unifying narrative. We focus on three key approaches:

Shared Foundations: We work with architecture and spatial design studio RO&AD, who act as spatial connectors. Together with stakeholders, they translate abstract geological themes into spatial and practical interventions that match the unique character of each area. All partners are treated as a 'family', so connections are natural and visible wherever possible. From municipalities to NGOs, from schools to nature managers—all recognize geology as a shared foundation rather than a distant scientific domain.
Experience and Visibility: To overcome the "invisibility" of our geology, we created an engaging cross-border Experience Map. It visualizes the landscape of the Geopark with the river Scheldt as its unifying blue thread. Around the edge of the map, accessible illustrations of subsurface layers offer a visual metaphor for how geology connects everything, past and present. The map serves as both a communication and orientation tool, inviting exploration of geosites, each with unique stories.
Towards Interactivity and Integration: We are now developing an interactive version of the map, where clicking on a geosite reveals virtual "subsoil sliders" and narrative layers—connecting themes like tidal systems, clay extraction, or geofood locations. This multi-thematic storytelling links physical landscape, geological history, and cultural identity in a tangible, visitor-friendly format.
Central to our strategy is the human presence: in the Schelde Delta, people have shaped the land as much as the land has shaped them. From ancient embankments to modern port cities, the dialogue between nature and culture is ongoing. Our approach invites stakeholders to embed this dual heritage into their own missions, turning local efforts into pieces of a larger puzzle.
We warmly invite other Geoparks to share their approaches to similar challenges. How do you connect across administrative, linguistic or ecological boundaries? How do you make the invisible visible? And how can we, together, build experiences that ground people—literally and figuratively—in the stories beneath their feet, and make them feel part of one cultural and geological history?

SUSTAINABLE INITIATIVES AND DIVERSIFICATION OF GEOTOURISM IN MINÉ-AKIYOSHIDAI KARST PLATEAU ASPIRING UNESCO GLOBAL GEOPARK, JAPAN

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Keywords: Miné-Akiyoshidai Karst Plateau Geopark, sustainable local development, geodiversity, geotours

Miné-Akiyoshidai Karst Plateau aspiring UNESCO Global Geopark is located in western Japan and covers an area of 472 km^2. The Geopark consists of a basin area that is surrounded by mountains of around 700 m elevation, and has a warm and humid climate. It was recognised as a Japanese national Geopark in 2015, and is currently an aspiring UNESCO Global Geopark.

The Geopark aims to build a sustainable community and society, while protecing the precious heritage of the Earth. As one of the methods to achieve this goal, the Geopark has been working on initiatives that are underpinned by an awareness of sustainability. In particular, the Geopark has established a partner system to strengthen the activities that involve the community, by collaborating with local groups that utilise the geological, natural, tangible cultural, and intangible cultural heritage of the Geopark area, and actively work for the future of the Earth. The Geopark not only assists the partners in creating packaging for their products, but also for product development and event management.

The sales of souvenirs at Miné-Akiyoshidai Karst Plateau Geopark Centre Karstar, the Geopark's hub facility, began in 2024. Products that are sold here include umbrellas which feature designs of fossils that were discovered in the Geopark area, as well as eco-friendly products such as tumblers made from coffee husks. We plan to use the sales proceeds to fund the conservation of geological heritage and educational activities.

In terms of geotourism, the Geopark offers geotours that not only introduce geological heritage as locations of scenic beauty, but link the significance of the geological heritage with environmental issues, and provide an opportunity for visitors to think about the Sustainable Development Goals in relation to their daily lives. The Geopark has also developed new geotours since 2024, including an accessible geotour, and is offering a diverse range of geotourism initiatives.

MANAGING A LIVING GEOPARK: STRATEGIES AND LESSONS FROM LESVOS ISLAND UNESCO GLOBAL GEOPARK

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Keywords: Geopark management, geoconservation, geotourism, community engagement, sustainable development

Lesvos Island UNESCO Global Geopark, situated in the Aegean Sea, in Greece, is internationally recognized for its exceptional geological and paleontological heritage, including the world-famous Lesvos Petrified Forest. This Miocene-era fossil forest, preserved in situ across a vast volcanic landscape, serves as the foundation for a broader approach to integrated heritage management that combines conservation, education, tourism and sustainable local development.

Lesvos Island UNESCO Global Geopark is not only a protected area but a living territory, a territory where people, heritage and nature coexist and evolve. This abstract outlines the key management strategies developed over more than two and a half decades, offering insights into how Geoparks can function as dynamic systems that respond to both environmental and social change.

A central challenge in Lesvos is managing a network of dispersed geosites, geotrails and visitor centers across the island. The Geopark has adopted systematic conservation measures, including protective infrastructure, erosion control and regular site monitoring, to preserve fragile fossils in situ. These are complemented by digital tools and interactive interpretation, enabling both physical and virtual engagement with the territory's geoheritage.

Education is a core pillar of the Geopark's work. Through field-based educational programs, museum learning experiences and international training courses, the Geopark promotes geoscientific literacy across all age groups. Collaborations with schools, universities and research institutions support a culture of lifelong learning.

The development of geotourism has contributed significantly to the local economy. The creation of geotrails, signage and guided tours has expanded opportunities for sustainable tourism, particularly in less-visited rural areas. The Geopark works closely with local stakeholders to ensure that geotourism initiatives align with community needs and deliver tangible benefits.

Equally important is community engagement. Residents are active participants in the Geopark's activities. This participatory model has reinforced a shared sense of ownership and responsibility for the protection of the island's natural and cultural heritage.

The experience of Lesvos Island UNESCO Global Geopark demonstrates how a Geopark can operate as a resilient, adaptive system, balancing conservation with innovation and heritage protection with social and economic development. The lessons learned from Lesvos are applicable to other territories seeking to build effective, inclusive and sustainable Geopark models.

INTANGIBLE HERITAGE AND COMMUNITY MUSEUMS: THE ROUTE OF ORGANIC MUSEUMS IN THE UBERABA GEOPARK

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Keywords: intangible heritage, traditional knowledge, community-based tourism, territorial development, geopark

The Uberaba Geopark Organic Museum Route represents an innovative strategy for safeguarding intangible heritage and promoting sustainable territorial development. Inspired by social museology, it proposes that communities take the lead in preserving and interpreting their own heritage. The proposal transforms the homes, workshops and studios of local cultural masters into living museums, where traditional knowledge and crafts are preserved and shared in an interactive way.

The main objectives of the project include preserving traditional knowledge; strengthening the creative economy and community-based tourism; valuing cultural identity and promoting heritage education. The actions were conducted based on ethnographic diagnosis, participatory cultural mapping and direct dialogue with the communities involved.

The Organic Museum Route currently comprises seven thematic units: confectionery, lutherie, bell casting, contemporary art, cardboard art, cachaça production and calico embroidery. Each unit is led by a local cultural master, who acts as curator of their knowledge. The initiative resulted in the consolidation of a cultural circuit that strengthens territorial identity, generates income, expands institutional recognition and promotes sociocultural inclusion.

The experience of the Uberaba Geopark confirms the effectiveness of organic museums as devices for cultural appreciation and sustainable development. The project contributes directly to Sustainable Development Goals (SDGs) 4: Quality education; 8: Decent work and economic growth; 11: Sustainable cities and communities and 12: Responsible consumption and production.

USE OF GEOHERITAGE IN ARCHIPELAGIC REGIONS, THE CASE OF AZORES UNESCO GLOBAL GEOPARK (PORTUGAL)

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Keywords: geoconservation, geoheritage, geoparks, geotourism, use value assessment

Geoparks are territories that, in addition to encompassing areas of significant geological relevance, aim to foster tourism, education, and scientific research by leveraging the value of their natural heritage through sustainable practices. This multifaceted mission underscores the need to assess the range to which geological heritage can be effectively used for such purposes—commonly referred to as its use value.

This study proposes a quantitative methodology for evaluating the use value of geosites within the Azores UNESCO Global Geopark, with particular consideration given the unique archipelagic characteristics of the territory. The assessment framework comprises 27 criteria, each associated with specific indicators, and evaluated on a scale of up to five points.

Applying this methodology to the 13 geosites identified in Terceira Island, generated individual use value scores, allowing for their classification based on their potential to support educational, recreational, and tourism-related activities. The outcomes of the evaluation enable the selection of key geosites for targeted investment in public engagement and infrastructure, and provide a basis for strategic planning to improve their access and promote wider recognition.

The proposed methodology represents a practical and evidence-based tool for the informed, conscious, and sustainable management of geological heritage. The findings offer a base framework to guide the responsible use of geosites, while simultaneously contributing to their conservation and ensuring their long-term viability for future generations.

INNOVATION PLATFORM FOR ART, TECHNOLOGY AND SUSTAINABLE TOURISM

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Keywords: sustainable local development, geotourism, fine arts, innovation operations

Saimaa UNESCO Global Geopark (UGGp) is located in Southeast Finland. It covers the southern part of Lake Saimaa, the largest lake in the country. With its beautiful landscapes, lively towns and idyllic villages Saimaa UGGp offers great potential for geo-tourism.

Innovation platform for art, technology and sustainable tourism is an on-going project, in collaboration between three universities and three UNESCO Global Geoparks (Saimaa UGGp, Salpausselkä UGGp and Lauhanvuori-Hämeenkangas UGGp). The project is funded by the European Union.

The aims of the project are to create an innovation platform that will integrate aspects of visual arts, technology and sustainable tourism, to increase competences in multidisciplinary teamwork and to model cooperation between professionals in the fields of visual arts, technology and sustainable tourism in Geopark areas. The project also aims to generate ideas on how art can be present in Geoparks.

The project measures include training and pilot workshops in Geopark areas. In Saimaa UGGp the first training and workshops were held in spring and early summer in 2025. These included webinars and workshops held in Savitaipale municipality. Saimaa UGGp personnel were involved in an expert role to tell about origin story of the landscape of the area, and also took part in the workshop.

As a results of the workshops, a lot of ideas emerged, and will be further developed. The ideas included themes like intangible art, gamification, environmental and art education and art trails. One of the results of the project is an art exhibition in the city of Lappeenranta in summer 2025. The exhibition is partly inspired by the geosites Kärnäkoski Fortress and its surroundings, where part of the workshops were held. The ideas will be further developed in the project, which goes on until April 2027, and new projects might be applied as well.

IMMERSIVE VISITOR EXPERIENCES, CHABLAIS UNESCO GLOBAL GEOPARK, FRANCE

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Keywords: geotourism, sustainable local development, immersive experience, visitor engagement

The Chablais UNESCO Global Geopark (UGGp) is at the forefront of innovation delivering the highest standards for learning and awareness raising in education and tourism. Currently it provides a wide range of facilities and activities for discovering the natural, cultural and human heritage of the Chablais region, as well as content addressing societal challenges such as understanding geodiversity and biodiversity, ecosystems stress, sustainable natural resource use and climate change.

Current offers include the Chablais UGGp Georoute, also known as the openair museum, which presents 23 emblematic, complementary and unique geosites with their natural history, legends, traditions and local farming practices. In addition, there is a network of partner museum sites, visitor points, educational farms and gardens, as well as regular scheduled and bespoke guided visits by official geopark guides and events organized by tourist offices.

Following a review of these products available to local inhabitants and tourists, the Chablais UGGp Commission identified a need to complete this offer with an interior, museum-style experience. Continuing to respect its integration within the region, a specific choice was made to develop three “Discovery Centres”, each one installed a different sub-administrative district within the Geopark territory. The discovery centres were installed in key heritage points of the Geopark: the Ripaille Castle, the Cachat Pump Room and Lake Montriond.

Overseen by a working group made up of local politicians, members of the Geopark team and scientists, the Chablais UGGp strategically created these innovative spaces. Each site has a focus, one is about the landscape of today and tomorrow, another explores water and the last soils and risks. Common to each however is the presentation of Geopark themes and values. Challenged by the site heterogeneity: indoor and outdoor sites, accessibility, opening periods, entrance fee policy, creative solutions were employed to deliver a clear, coherent and yet innovative visitor experience. To complete the visit, a smartphone application was developed which provides for example, short films with local experts, residents and farmers discussing challenges such as respecting nature and climate change.

The Ripaille Castle, officially opened on 3rd July and is the first of the trilogy of discovery centres to be completed. The event, widely reported in the press has generated much interest. Over the summer period, the impact of this new visitor centre will be assessed.

THE GEOPARK AND THE SENIORS CLUB: PRACTICAL WAYS OF ENGAGING VULNERABLE GROUPS IN THE DANUBE GEOTOUR PLUS INTERREG PROJECT

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Keywords: geotourism, social inclusion, vulnerable groups, heritage interpretation, participatory governance

This communication presents a practical case of social inclusion within the framework of the Danube GeoTour Plus Interreg Project, focusing on the collaboration between the Hațeg Country UNESCO Global Geopark and the Seniors Club of Hațeg town. The project promotes the development of inclusive and sustainable geotourism across the Danube region, with a strong emphasis on engaging vulnerable groups—among them, isolated seniors.

The Geopark initiated a participatory approach through the elaboration and implementation of a dedicated Action Plan for the inclusion of vulnerable groups. Seniors were actively involved in co-designing educational and tourism activities, capturing local memory and heritage through storytelling workshops, guided walks, and intergenerational events. These actions were coordinated by the University of Bucharest, which also played a leading role in ensuring that the activities aligned with the project's horizontal principles: inclusivity, sustainability, and adaptability.

The presentation will highlight the steps taken to build trust and meaningful collaboration with the Seniors Club, the methods used to collect and valorise local knowledge, and the outcomes achieved so far. It will also reflect on how one illustrative element of the Geopark Experience—co-developed with seniors—is being piloted in the Casa Geoparcului exhibition, while the broader concept remains open for future implementation.

The case demonstrates how geoparks can serve as inclusive platforms that empower vulnerable groups to become active contributors to heritage interpretation and community-based tourism, offering a replicable model for other territories in the UNESCO Global Geoparks Network.

MINING AND GEOHERITAGE SYNERGIES IN UNESCO GLOBAL GEOPARKS: CONTRIBUTIONS TO INFRASTRUCTURE, CONSERVATION, AND SUSTAINABLE DEVELOPMENT GOALS

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Keywords: geoconservation, engagement, stakeholders, mining, geoparks

This study aimed to classify and correlate mining-related discoveries in UNESCO Global Geoparks (UGGps) with geoheritage significance, geological features, mining practices, and sustainable development outcomes. By analysing 213 geoparks through 15 distinct criteria, it was found that over one-third (35.68%) have contributed to mining-related infrastructure, designations, or museum collections.

More than 50 geoparks actively integrate mining sites and heritage into education, conservation, and sustainable development initiatives. Results show that the stronger the mining-geoheritage connection, the greater the number of infrastructures and strategic actions related to mining. Numerous best practices were identified, including educational programmes, geotourism trails, conservation of mining geosites, partnerships with extractive industries, and policy measures to protect geoheritage.

These actions have contributed significantly to achieving at least eight of the UN's Sustainable Development Goals (SDGs), particularly those concerning education, community development, clean energy, responsible production, and heritage preservation.
The paper concludes by recommending global and regional frameworks for enhancing the mining-geoheritage relationship within geoparks, and encouraging initiatives inspired by successful examples such as museum networks, educational centres, and international collaborations.

GEO-CONSERVATION AND SOCIO-ENVIRONMENTAL ENTERPRISES: LESSONS LEARNED FROM THE QUELCCAYA GEOPARK PROJECT AND COMMUNITY RESILIENCE IN THE ANDES

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Keywords: geoparks, sustainable local development and geoturism, innovation, resilience

The Quelccaya Geopark project represents a paradigm of sustainable development in the Peruvian Andes. Its designation aims to act as a catalyst for local development, integrating geotourism, scientific research, and technological innovation. Through a "bottom-up" management model, local communities are empowered as main actors, generating enterprises based on territorial resources and supported by advanced technologies such as Artificial Intelligence (AI) for research and environmental management.

Geotourism and Community Innovation

Geotourism in Quelccaya is built upon a participatory approach. Local communities, through innovation training programs, provide specialized tourism services such as thematic guiding and homestay accommodations, fostering cultural exchange and the valorization of ancestral knowledge.

Scientific-cultural tourism is designed for visitors with interests in geology, glaciology, biology, and ornithology, guided by trained specialists who provide in-depth interpretation of the territory.

Scientific Research and Climate Adaptation

The Quelccaya Geopark is conceived as a natural laboratory for research applied to climate change adaptation. Key areas of study include:

Artificial glaciers as a water management strategy.
Assessment of high-Andean wetlands (bofedales) as carbon sinks.
Research on the Glacier Finch, the only known bird that nests directly on a glacier at 5,300 masl.
The integration of information technologies enables real-time monitoring of glaciers and ecosystems, contributing to the prediction of glacial dynamics and the optimization of natural resource management.

Innovation and Local Enterprises

The district of Corani stands out for its potential in implementing these models. Notable innovative projects include: Sustainable domes built with ichu grass, serving as eco-lodges, conservation areas, or "warm houses" for local populations.
Development of healthy geo-products derived from ichu, camelid immunoglobulin, and the combination of silver with alpaca fibers.
These enterprises are grounded in environmental impact studies and principles of sustainability and community resilience.

Conclusions

The Quelccaya Geopark project goes beyond environmental conservation: it constitutes a strategic imperative for socio-environmental resilience. By integrating science, innovation, and community participation, it provides solutions for water management, climate adaptation, and the prosperity of Andean communities.

TORATAU GEOPARK – SUSTAINABLE TOURISM IN THE CENTRE OF EURASIA

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Keywords: sustainable local development, geotourism

In my presentation "Toratau Geopark – sustainable tourism in the center of Eurasia", I want to share our experience in preserving the unique geological site of shikhan Toratau, on the one hand, and developing tourism in this area, on the other. The shikhans of Toratau, Yuraktau and Kushtau are Permian fossil reefs and well - known unique geological objects, whose age reaches 300 million years. (Shikhan means *a single mountain*). Walking through the shikhans, you can discover fossils of ancient marine organisms that once lived in this area. Due to the outbreak of the pandemic and the closure of borders, domestic tourism began to develop at a high rate, however, the increased uncontrolled tourist flow began to pose a danger to the red Book plants growing in large numbers on shikhan, as well as to the red book insects inhabiting this territory. In addition, there was a question of preserving paleontological specimens on shikhan. Therefore, local residents, scientists and the directorate of the geopark appealed to the Head of the republic in order to solve the problem of uncontrolled visits to this unique object. So it was decided to build an ecotrail to the top of shikhan Toratau. However, there were also those who disagreed, as the population had questions about how the stairs would be erected, whether they would spoil the view of the mountain, and whether the entrance to the stairs would be paid for.

But at the same time, it was necessary to solve the problem of developing the territory near shikhan, since the geopark's visitor center could not fully cover all tourist requests, it became necessary to build additional sites for selling souvenirs, holding presentations, catering, and familiarizing guests with the historical and cultural component of the geopark.

I will tell you more about the difficulties of implementing this project, how to solve the problems that arise, how to communicate with locals, as well as the successful results of the project in my presentation.

ASTROTOURISM IN THE VILLUERCAS IBORES JARA GEOPARK: THE DEVELOPMENT OF A SUSTAINABLE TOURISM PRODUCT

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Keywords: astrotourism, geotourism, sustainable local development

Stargazing is a unique moment, during which you forget the hustle and bustle of everyday life and connect with the cosmos. Astrotourism is in fashion, but not all places offer the best conditions. The Villuercas Ibores Jara Geopark is a sparsely populated area, but this also has the advantage of less light pollution, making it a benchmark for stargazing and interpretation in a unique setting.

Throughout the presentation, we will detail how we have worked in 2025 to enhance the value of a sustainable tourism resource that generates opportunities for the local population. From caring for and protecting the resource through Starlight quality certification to promoting the destination for skywatching with Astrodisea.

The first edition of Astrodisea, a multi-day event led by the companies of our geopark, was a celebration of the Starlight quality certification. An event to embark on an experience where nature, the cosmos, and the senses come together in an unforgettable journey.

All of this is part of a broader strategy for the "Positioning of Astronomy Tourism in the Villuercas Ibores Jara UNESCO Global Geopark," which aims to provide the destination with a roadmap outlining the priorities to be followed to position the Geopark as a key astronomy tourism destination in the global market.

This strategy includes an analysis and diagnosis, as well as an action plan, the conclusions, objectives, and most important actions of which we will share in our presentation.

A process in which local businesses have actively participated, workshops and working meetings have been held, and local governments have made commitments to safeguard the resource. This work has also involved relationships with other geoparks, and the results have been included in our geopark's overall development strategy.

GEOTOURISM IN CAÇAPAVA GEOPARK: SHARING EXPERIENCES FROM THE PERSPECTIVE OF A LOCAL (GEO)TOURISM COMPANY

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Keywords: sustainable local development, geoeducation, environmental interpretation, trail walking, Guaritas Geotourism

Caçapava do Sul, located in the extreme south of Brazil, was recognized in 2015, through a state law, as the Capital of Geodiversity. More recently, in 2022, it achieved the status of World Geopark by UNESCO. These recognitions are a result of its rich diversity of rocks and landforms. Due to this geomorphological variety, Caçapava do Sul and its surroundings have become a popular destination for sportspeople and tourists looking for adventure activities in nature, mainly hiking, cycling and climbing. In this context, in 2018 Guaritas Geotourism emerged, a company specialized in offering inbound tourism services in the Caçapava Geopark and adjacent regions, with an emphasis on valuing geological aspects, also addressing questions about the biodiversity of the Pampa Biome and local history and culture. This work aims to publish some of the experiences lived by this company in these 5 years of existence, in order to guide actions for future entrepreneurs in this area, both in the Caçapava Geopark and in other geoparks or regions with geological relevance. Guaritas Geotourism has operated mainly in the short-term hiking modality (a few hours to up to a day), always with a tour bias. Most of the time, services are contracted by searching for the agency on social networks or recommending third parties, such as the Caçapava do Sul Municipal Tourism Department. The most popular attractions have been Serra do Segredo, Guaritas, Minas do Camaquã and Rincão do Inferno. For safety purposes and a better teaching experience, services are normally available with two guides and when there are large groups, the ratio of one guide to a maximum of 10 tourists is maintained. Services contracted by schools stood out, which, motivated by the aspects of environmental education that the Geopark provides, brought groups of students from basic education and higher education (Physical Education and Biology), providing excellent geoeducation actions. In general, customers always show great satisfaction with the product received, especially with the environmental interpretation provided, which would never be possible on a self-guided tour. It should be noted that since its creation, the company has not been able to sustain itself solely with this source of income. This is due to the low flow of tourists, which tends to concentrate on weekends and holidays and on a seasonal basis, with very low movement during rainy periods, for example. Furthermore, the company went through the entire crisis generated by Covid-19, in which the tourism sector was the most affected. Therefore, it is recommended that entrepreneurs in geotourism keep these characteristics in mind, which tend to be widespread in most parts of the world.

GEOFESTIWAL KIELCE AS A TOOL FOR SUSTAINABLE DEVELOPMENT AND PROMOTION OF GEOTOURISM IN THE HOLY CROSS MTS. UNESCO GLOBAL GEOPARK, POLAND

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Keywords: geofestiwal, geotourism, sustainable development, geopark

Geofestiwal Kielce is one of the key events within the Holy Cross Mountains UNESCO Global Geopark, promoting the sustainable use of post-mining areas in geotourism, education, and outdoor sports. The event has been held annually since 2022. Geofestiwal Kielce takes place in three locations: Wietrznia, Kadzielnia, and the Botanical Garden. The first two sites are former mining areas associated with the historical exploitation of Devonian limestone. The last location, the Botanical Garden, is linked to the historical mining of lead ore.The main idea behind Geofestiwal is to promote the unique geological and natural heritage of the Geopark through education and sustainable tourism. This idea is implemented through a festival format that includes several key elements:

- organizing attractions related to active tourism, outdoor sports, and recreation within the former Kadzielnia quarry;

- organizing attractions focused on popularizing Earth sciences and related fields, as well as geoeducation, within the post-mining area of Wietrznia – Geoeducation Center;

- organizing attractions related to the promotion of natural heritage and ecological education in the Botanical Garden.

Each of these components aligns with the core idea of the Geofestiwal while utilizing the specific potential of the locations where the event is held. The festival's format, based on the involvement of local entrepreneurs, non-governmental organizations, and institutions subordinate to the municipalities of the Geopark, is one of the most effective tools for promoting geotourism and stimulating sustainable local development. A key aspect is that the local community within the Geopark area acts both as a co-organizer and as a participant/audience of the event. The attendance figure from 2024 edition – 7 200 participants, indicates that the event enjoys great popularity among local community.

TOURS THAT USING TOOLS TELLING THE STORY OF THE BLESSINGS OF THE EARTH IN THE TOYA-USU UGGP

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Keywords: volcano, blessing of the earth, gastronomy, guide tools, textbook

This presentation will introduce the methods of communicating the "story of the earth" in Toya-Usu UNESCO Global Geopark, and the practice of tours that utilize new gastronomy, which is a further development of previous efforts.

First, the picture book "A Day on the 110,000 Years," which was published in 2014, was created for local adults to feel and understand the connection between the underground world beneath their feet and the life rooted in the land. Then, from 2015 to 2018, "Food and Earth Story Cards (24 types)," we created for tourists to tell about the food culture of the UGGp and the geological factors that influence it through.

This year, we go a step further, create a textbook for guides of the UGGp, "The Story of the Blessings of the Earth in the Toya-Usu UGGp." This new tool contains more detailed information and scientific explanations than conventional picture books and cards, and is designed to enable geopark guides to provide tourists with deeper knowledge of the geology and food culture of the region. We will introduce how these tools are actually used in the geopark tours and the contents of the new geopark tour experience that combines gastronomy and adventure travel.

FROM A COASTAL TERRITORY TO A UNIFIED MARINE AND TERRESTRIAL GEOPARK – THE EXAMPLE OF THE OESTE GEOPARK (PORTUGAL)

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Keywords: geopark, oeste, extension, marine area, geosites

The Oeste UGGp encompasses six municipalities (Bombarral, Cadaval, Caldas da Rainha, Lourinhã, Peniche, and Torres Vedras) with a total area of 1154 km² and 213 thousand inhabitants. Located in western-central Portugal, one hour North of Lisbon, it has a 72 km long coastline and stretches around 30 km wide inland. This Geopark has been established based on its world-renowned palaeontological content, especially the Late Jurassic dinosaur fossils, including several holotypes, trackways, and egg nests with embryos. Also of international relevance is the Toarcian GSSP recognized by IUGS and the Cretaceous well-preserved early angiosperms.

Just after the official approval of the Oeste UGGP in March 2024, new challenges emerged and were faced, on two different fronts: A) to complete the geographical and geological extent of the initial territory; and B) to open and launch the Geopark into its adjacent marine area. The first front corresponded to the inclusion of two more municipalities: i) Óbidos, a visible hiatus resulting from meanwhile solved administrative issues; ii) Alenquer, completing the Jurassic extension of the territory, thus reaching the eastern border of the Mesozoic basin. The second front, the marine areas, had been addressed in the early phases of the application but was not fully mature to be included. Moreover, the evaluation process specifically pointed out the importance of the adjacent marine areas and strongly suggested their future inclusion.

The presence of a small archipelago just in front of the Peniche municipality, and administratively belonging to it, naturally guided the first extension ideas. More importantly, that archipelago is a National Natural Reserve of ICNF (Portugal) and a Biosphere Reserve of the UNESCO MAB program, naturally leading to extending the Geopark to the limits of those protected areas, after official agreement with their management entities. The 20 km straight distance to the western tip of this Reserve has then been applied to the whole coastline, thus encompassing a new submarine area with 1,442.87 km². Within this area, several new geosites have been defined, bringing very different and important highlights to the Geopark: a) Berlengas archipelago islands, a group of Palaeozoic emerged horsts corresponding to the western border of the Atlantic opening; b) the submerged continental platform, totally exposed during the last glaciation, with several geomorphologic features; c) the deeply incised Nazaré Canyon, world known for its giant waves.

With this extension of the territory into the marine realm, the Oeste Geopark now encompasses the whole time and space width of the North Atlantic opening and, at the same time, embraces new challenges related to the blue economy and the marine ecosystems.

SAI KUNG HOI ARTS FESTIVAL: AN INNOVATIVE GEOPARK TOURISM INITIATIVE INTEGRATING LOCAL CULTURE, ARTWORKS AND DIVERSE EVENTS

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Keywords: cultural heritage, geotourism, local communities, sustainable development, arts festival

From 2022 to 2024, Hong Kong Geopark, in collaboration with Tourism Commission, launched the **Sai Kung Hoi Arts Festival (**https://skhartsfestival.hk/en/**)**. Through multidisciplinary artworks and diverse activities, this initiative promoted the natural and cultural heritage of the Sai Kung area and served as a platform to integrate its unique heritage, fostering a deeper connection among visitors, local villagers and the landscape of Sai Kung. As a geopark tourism promotion event, it created a ripple effect that benefited both social and economic development in the area. In line with the core missions of UNESCO Global Geoparks, the arts festival demonstrated how a geopark can achieve these goals seamlessly in a single event.

The festival unfolded across four islands in the Sai Kung Volcanic Rock Region of Hong Kong Geopark. The festival activities were organised every year for three years from November to January. They included performances (such as dance and martial arts), cultural activities (such as cooking village dishes, rowing a wooden fishing boat and making of children's toys), guided tours on diverse themes (such as geology and local Catholic history), family programmes (such as making sand art and beach cleaning), and sports events (such as canoeing and hiking). These activities catered for a diverse audience and fostered community participation and engagement. A notable highlight of the festival was the creative art installations. This included 29 artworks created by local and international artists, some of which were co-creations involving the public. The artworks addressed themes such as villagers' stories, rural-urban balance, nature conservation, cultural inheritance, religion and culture. One artwork was designed for visually impaired visitors, and inclusive guided tours were arranged for individuals with various needs. Over three years, the festival organised more than 1,500 events, attracting more than 200,000 visitors. Most of the artworks remained after the festival, continuing to attract visitors. Taking the advantage of the festival, a public ferry service was resumed and a new island-hopping tour was launched by the geopark.

The festival was a collaborative effort, involving curators, artists, local communities and geopark staff, working together to explore the geological features, natural environment, culture, history, collective memories and intangible cultural heritage of the geopark communities. This meaningful engagement played a valuable role in rediscovering and preserving the valuable historical narratives of the communities, integrating cultural content with natural heritage. The captivating artworks not only served as visual spectacles but also functioned as powerful educational tools, effectively communicating complex messages about environmental protection and cultural appreciation. The immersive experience offered by the artworks and activities also deepened visitors' understanding of, and relationship with, the region's rich natural and cultural significance, creating lasting memories and appreciation for the area's heritage.

The festival's success highlights a promising and innovative initiative, showcasing how the intersection of art, culture and nature can foster sustainable development for all stakeholders, representing a new direction for the geopark's development.

THE ALGARVENSIS GEOPARK AS A DRIVER OF LOCAL IDENTITY: THE CASE OF PENINA EM FESTA

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Keywords: Algarvensis Geopark, participatory heritage, intangible cultural heritage, community involvement, education and interpretation

GeoPalcos – Art.Science.Nature is a biennial initiative developed within the framework of the aspiring Algarvensis UNESCO Global Geopark (aUGGp), aiming to promote dialogue between art, science, and nature in a territory shaped by deep geological time and vibrant cultural traditions. Among its most enduring outcomes is the community-driven project "Penina em Festa", which has evolved into a significant example of good practice in participatory heritage valorisation. Rooted in the small inland village of Penina, guardian of fossil outcrops of international relevance where Metoposaurus algarvensis was first discovered, this initiative reflects a long-term strategy of community involvement. The scientific relevance of the fossil beds initially sparked outreach activities led by the Geopark. Over time, this engagement evolved into a more profound process of local appropriation, with the community itself initiating and sustaining activities that integrate geological heritage into its own cultural expressions. A particularly emblematic example is the Penina Children's March, a reinterpretation of the popular "marchas" tradition infused with themes linked to the local landscape and paleontological legacy. Developed with strong intergenerational participation, the march now involves students, educators, artisans, artists, and volunteers from the surrounding area. It incorporates elements such as costumes inspired by fossils, lyrics referencing the ancient ecosystems of the territory, and choreographies that symbolically narrate the connection between people and land. The Geopark supports this initiative by fostering scientific literacy, offering logistical and creative support, and promoting visibility through its educational and cultural networks. "Penina em Festa" is thus more than a cultural event; it is a living laboratory of community-based heritage interpretation. It includes thematic walks across fossil-rich geosites, traditional knowledge workshops (e.g., lime production, esparto weaving, botanical uses), and activities that highlight the links between geological resources, sustainability, and identity. These initiatives are not externally imposed but rather co-created and co-managed with the local population, reinforcing a sense of ownership and pride. This case exemplifies how an aspiring Geopark can act as a catalyst for community-led processes that align with the core values of the UNESCO Global Geoparks Network. By connecting scientific knowledge with cultural continuity and by investing in long-term relationships with local actors, the Algarvensis aUGGp contributes to building more resilient, informed, and cohesive communities. The village of Penina stands today as a model within the Algarvensis territory, illustrating how local heritage, both tangible and intangible, can be dynamically reinterpreted when grounded in shared knowledge, emotional attachment, and active participation. It demonstrates the transformative potential of Geoparks when they genuinely work with and for their communities.

GEOPARKS, SUSTAINABLE LOCAL DEVELOPMENT AND GEOTOURISM: THE CASE OF THE HIN BOUN AUGGP IN LAOS

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Keywords: aUGGp; local development; local empowerment; ecotourism; indigenous knowledge valorization

The development, with the support of the SMERGC (Chauvet Cave), of the *Hin Boun aspiring UNESCO Global Geopark (aUGGp)* in central Laos shows how geoparks can serve as powerful tools for sustainable local development, geotourism, and the valorization of indigenous knowledge. Situated in a unique karstic landscape, the Hin Boun territory is rich in geological, natural, and cultural heritage. It is also home to the *Association Écotouristique de Konglor-Natane (AEKN)*, the first ecotourism community-based association in Laos and a pioneering model of inclusive, sustainable tourism management in rural settings.

Founded in 2014 with support from the French Development Agency (AFD) and the NGO Tétraktys, AEKN manages the iconic Konglor-Natane cave system. Visitors travel through this 7.5 km subterranean river by boat, connecting the valleys of Konglor and Natane in the heart of the Phou Hin Poun massif. Heart of the upcoming geopark, this unique site became a focal point for community engagement, where tourism is developed with and for the local population.

The AEKN's governance model empowers villagers by organizing them into professional activity groups offering services such as electric boat rides, guided tours, handicrafts, mountain bike excursions, homestays, and local cuisine. This structure ensures a fair redistribution of tourism revenues and reinforces environmental stewardship. Community knowledge and traditional practices are in the way to be integrated into site interpretation, landscape management, and the design of sustainable visitor experiences.

Beyond tourism services, AEKN has promoted complementary initiatives such as micro-projects for handycraft, for sustainable agriculture, food processing, and a signature menu based on local products. These activities strengthen food sovereignty, diversify income sources, and reinforce cultural identity. Environmental preservation is central to the model, with local solutions for waste management and water access improving both village living conditions and tourist satisfaction.

The emerging Hin Boun aUGGp has been build on this community-led foundation to develop a broader territorial dynamic rooted in the UNESCO Global Geopark philosophy. The initiative supports local governance, protects natural and cultural heritage, and promotes geotourism as a means to foster pride, education, and economic opportunity. In line with the Lao government's strategy to expand ecotourism in rural areas, this bottom-up, participatory approach sets the stage for international recognition, sustainable livelihoods, and a stronger voice for local and indigenous communities in territorial development.

RESEARCH ON JIUHUASHAN GLOBAL GEOPARK DRIVING SUSTAINABLE ECONOMIC DEVELOPMENT IN ITS SURROUNDING AREAS

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Keywords: sustainable development, geopark, surrounding areas, Jiuhuashan

Global Geoparks are high-quality eco-tourism areas aimed at enhancing the well-being of residents and promoting sustainable economic development. The establishment of Jiuhuashan Global Geopark (Jiuhuashan UGGp) has led to a prominent brand effect with spillover characteristics, profoundly influencing the spatial organization of eco-tourism around Jiuhuashan. Based on the analysis of brand and economic spillover effects of Jiuhuashan UGGp, it is believed that the tourism economic activities of surrounding towns and villages are highly correlated with Jiuhuashan UGGp 's brand, such as Lingyang, Zhubei, Yangtian, Rongcheng, Miaoqian, Ducun, Dunshang, Tangxi. Based on the overall planning of Jiuhuashan UGGp, a coordinated development area has been set up around the Geopark, covering an area of 320km^2. According to ecological, production, and living characteristics of each town, we will promote planning, marketing, industrial, service, and governance linkages in an integrated manner to accelerate eco-tourism development around Jiuhuashan. We formed a coordinated development of eco-tourism around Jiuhuashan with Jiuhuashan UGGp as the leader, supported by important scenic areas such as Shenlong Valley and Lianfeng Yunhai scenic areas, with Jiuhuashan High-speed Railway Station as the hub and Rongcheng-Tangxi (S358 Provincial Road)-Lingyang-Rongcheng (G330 National Highway) transportation ring as the framework, supplemented by Rongcheng urban recreation areas, Zhubei Zen meditation town, Lingyang cultural and creative town, Miaoqian sports and leisure town, Dunshang-Liu Street intangible cultural heritage experience and inheritance town, and Tangxi original eco-tourism experience town. We will establish a tourism marketing alliance and implement brand promotion initiatives; create a series of characteristic route products; cultivate and develop new agricultural business entities led by ecological agricultural products such as tea and sealwort, and develop them into Jiuhuashan UGGp partners; build and renovate over 100 unique guesthouses to form a guesthouse cluster; and create over 20 special agricultural tourism complexes integrating sightseeing, tourism, and leisure in Nanyang, Zhubei, Shimengao, and Ducun.

DEVELOPING GEOTOURISM IN LANG SON UNESCO GLOBAL GEOPARK

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Spanning over a vast territory of 4,842.58 km2, Lang Son UNESCO Global Geopark is a gem in the mountainous region of Northern Vietnam. It is a living testament, encapsulating in its diverse landscapes the journey through 500 million years of life's evolution. From ancient seas and volcanic lands to ironwood forests, each facet of the Geopark tells a unique story. The Geopark is a vibrant tapestry of ethnic diversity, with contributions of unique customs and traditions from each ethnic group. The spiritual life of the Geopark is deeply rooted in Dao Mau, a Mother Goddess worship belief recognized by UNESCO as a representative intangible cultural heritage of humanity. The harmonious combination of natural history, cultural diversity and spiritual traditions makes Lang Son UNESCO Global Geopark a unique destination to explore and discover.

Lang Son UNESCO Global Geopark has a majestic natural geological and geomorphological terrain, with about 182 geosites, some geotrails, 200 caves, sinkholes, containing countless interesting and attractive things. This will be a resource to promote the development of Geotourism. Coming to Lang Son UNESCO Global Geopark, visitors will have mysterious and unique journeys of discovery, with memorable experiences.

In this presentation, the author will introduce the potentials to develop geotourism in Lang Son UNESCO Global Geopark as well as propose solutions to promote this kind of tourism in the upcoming time.

ECONOMIC AND SOCIAL IMPACT OF THE UNESCO GLOBAL GEOPARK THÜRINGEN INSELSBERG-DREI GLEICHEN AND ITS RELATED PROJECTS ON THE REGIONAL DEVELOPMENT

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Keywords: geotourism, Bromacker fossil site, visibility, economic impact

The UNESCO Global Geoparks were established in 2015 and developed alongside a corresponding increase in the demand for geotourism. The UGGps are also developing their own strategies to enhance environmental education and to actively improve the economic and social conditions of the regions where they are located. Despite this, the lack of dedicated personnel and projects to evaluate the Geoparks' impact represents a challenge for all Geoparks worldwide.

To address this challenge, the UGGp Thuringia Inselsberg Drei Gleichen has already developed several surveys to improve its offerings. For example, the Bromacker fossil site, despite its scientific importance, accessibility, and central role in obtaining UNESCO Geopark recognition, was found to be almost unknown among locals and tourists in the region. By leveraging the potential of the Bromacker and other Geopark-related projects, interviews and surveys with citizens and tour operators were carried out and evaluated. Furthermore, the opinions of companies cooperating with the Geopark were included. Among the preliminary results, the interviews with companies highlighted the Geopark-related project as a significant economic opportunity, and the visibility of the Bromacker fossil site has increased dramatically.

HIGHLANDS.3 - COLLECTIVE APPROACH OF RESEARCH AND INNOVATION FOR SUSTAINABLE DEVELOPMENT IN HIGHLANDS

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Keywords: highlands, sustainable development, research, innovation

Highland regions are home to vital ecosystems which provide numerous goods and services which are vital for the maintenance of the environment and the communities that live in these areas. However, these areas often lack evidence-based models and tools for sustainable local development.

With this in mind, the project HIGHLANDS.3 was born. Funded by the EU, this project's goal was to contribute to Inclusive Sustainable Development in Highlands through collective and impact-driven Research & Innovation, based on capacity building, sharing of local-global knowledge, experience, and tools. Through this approach, the project promoted co-innovation processes through secondments (scholarships for the project's partners) and research and innovative sessions involving public/private and non-academic partners, which helped build a shared vision of Inclusive Sustainable Development in Highlands, enhance the capacities of researchers, managers, users, policymakers, thus bridging the gap between research and development.

The project HIGHLANDS.3 consists of a network of 45 institutions including 32 partners from Europe (~35% non-academic), with other continents represented, such as South America and Africa, joining skilled and motivated female and male researchers and local stakeholders around a common goal.

The work plan implemented throughout the project focused on two main initiatives. The first was the promotion of 8 Research & Innovation Sessions (5 in Europe, 4 in other continents) that fostered the exchange among participants as a foundation for innovation. These Research & Innovation Sessions were built upon collective learning principles and a holistic systemic approach, exposing participants to a wide range of world views that encouraged experimentation with practice. Each Research & Innovation Session focused on a particular aspect of sustainable highland development and included collective learning, collaborative research, and capacity building on data collection/analysis, modelling.

To complement the Research & Innovation Sessions, long-term secondments were implemented for researchers and practitioners to deeply train and work together on specific issues identified by the consortium.

At the end of these initiatives, the collected data on Inclusive Sustainable Development in Highlands will be stored in an online collaborative and interactive decision-support platform that will then be transferred to existing mountain networks, thus contributing to new ideas and strategies that can cement mountains as living laboratories for the implementation of innovative solutions for today's challenges.

BOHOL ISLAND GEOPARK: TRANSFORMING DEVELOPMENT THROUGH PARTICIPATORY GOVERNANCE

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Keywords: sustainable local development, participatory governance

The designation of Bohol Island as the Philippines' first and only UNESCO Global Geopark marks a historic milestone—not just for the province, but for the entire country. In the absence of a national geopark policy or enabling legal framework, Bohol's designation presented both a remarkable opportunity and a complex set of challenges. The designation is more than a global recognition—it became a catalyst for provincial transformation grounded in sustainability, inclusivity, and participatory governance. This presentation explores how Bohol Island Geopark has institutionalized reforms that integrate geoconservation, education, and sustainable development through inclusive and community-based approaches.

Bohol has long been a top tourism destination, known for its stunning natural landscapes such as uplifted marine terraces, karst formations, fossil-rich hills, diverse marine ecosystem and the world-famous Chocolate Hills. Yet, before becoming a geopark, these features were mostly promoted for tourism value alone, with little emphasis on raising awareness and appreciation of their geological or cultural significance. The Geopark model changed this -putting conservation first before profit. Community guides were trained highlighting the stories behind the land and recognizing local communities as active stewards of both nature and heritage.

To ensure inclusive management, the Bohol Island Geopark and Regenerative Island Management Council was created. This multi-sectoral body includes local government units, national agencies, Indigenous Peoples, civil society, youth, tourism stakeholders, and academic institutions. The Council plays a key role in aligning development with Geopark values geoconservation, education, and sustainable growth.

Through participatory governance, Bohol introduced key reforms: integrating geopark principles into the provincial government's development agenda, revising the environment and tourism codes to protect geosites and manage visitor impact, support geosite communities and sustainable land use. These policies were built through consultations, community mapping, and collaborative planning—giving Boholanos an active role in the geopark's development.

Through the 4Geon Project, partnerships with the Department of Education were forged. Geopark camps, mobile exhibits, and community storytelling activities made the youth and younger children learn more about geoheritage and its connection to local identity, resilience, and the environment - building a new generation of stewards.

Without a national geopark framework, Bohol faced real challenges—such as limited funding, lack of legal protection for geosites and protected area management and fragmented agency support. But these challenges also pushed the province to develop creative community-based solutions and innovation. The Geopark became a catalyst for regenerative developments, green infrastructure, nature-based tourism and climate-resilient planning.

Bohol's experience illustrates how participatory governance can transform communities when driven by strong local vision, inclusive legislative support, and multi-sectoral collaboration- a whole of province approach. It is not only a story of local innovation but a model for how participatory bottom up governance can lead to national change. It also makes a strong case for the Philippines to institutionalize a national geopark strategy to support to aspiring geoparks in the country.

GOVERNANCE CHALLENGES AND OPPORTUNITIES FOR SUSTAINABLE DEVELOPMENT IN INDONESIAN GEOPARKS

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Keywords: geopark, governance, sustainability

UNESCO Global Geoparks (UGGps) demonstrate an integrated model for sustainable development, combining environmental protection, economic benefits, and community empowerment. Indonesia, with its exceptional geological and biological diversity, has embraced this approach to drive regional progress through its geoparks. Yet 17 years later, key challenges remain, such as environmental damage, poor stakeholder involvement, and weak public understanding of geopark concepts, hindering their full potential. These issues have prompted UNESCO Global Geopark to take corrective measures, notably issuing yellow cards and conducting revalidation missions for both Toba Caldera UGGp and Belitong UGGp. Successful geopark management requires four key pillars or study parameters: 1) policy coordination to align local actions with UNESCO standards, 2) capacity building to enhance management skills via specialized training programmes, 3) sustainable financing by diversifying funding sources while engaging stakeholders, and 4) performance tracking by implementing rigorous monitoring systems. Together, these components create a balanced approach that simultaneously protects geological heritage and supports community development. Thus, this study examines strategies to strengthen Indonesia's UNESCO Global Geoparks as catalysts for sustainable regional development. This study employs qualitative methods, including stakeholder interviews with geopark managers, officials, academics, and community leaders—to assess governance effectiveness. It combines this primary research with analysis of policy documents, UNESCO standards, and scholarly literature to evaluate gaps in four key areas: policy implementation, regulatory frameworks, financial models, and community engagement. The research proposes an integrated framework emphasising multi-level stakeholder collaboration, networking with ASEAN countries geoparks, and strict adherence to UGGp principles. These recommendations offer a pathway for Indonesia to optimise its geoparks as sustainable development catalysts while providing transferable insights for global geopark governance. The study ultimately demonstrates how strategic governance reforms can transform geoparks into powerful platforms achieving both heritage preservation and regional prosperity.

A CASE OF YANDANGSHAN GLOBAL GEOPARK DRIVING LOCAL ECONOMIC SUSTAINABLE DEVELOPMENT

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Keywords: geopark, sustainable local development, geotourism

In the course of its development, the Yandangshan Global Geopark has deeply integrated the concept of "Lucid waters and lush mountains are invaluable assets" into rural revitalization. Leveraging its unique natural resources, the geopark has developed models such as Geology + Dendrobium Town and Geology + Ancient Dwellings. It has actively explored and successfully practiced development models that align with the United Nations Sustainable Development Goals. The geopark has guided local community residents to develop ecological agriculture. Its partner, Tiefengtang Enterprise, in collaboration with scientific research institutions and universities, has used technological means to achieve the industrial propagation and wild population return of Dendrobium. This has transformed traditional enterprises into modern green enterprises, creating employment opportunities for over 50,000 people in the surrounding areas. Not only has this initiative helped the local residents of Yandangshan achieve poverty alleviation and prosperity, but it has also extended to Jinping County in Guizhou Province of China, to assist local villagers in poverty alleviation, thereby fulfilling the United Nations Sustainable Development Goals.

HISTORIC CENTER OF OMITLÁN JUÁREZ: CANDIDATE GEOSITE IN THE COMARCA MINERA GEOPARK, MÉXICO

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Keywords: biocultural heritage, geoproducers, heart of the geopark.

Located in the heart of the UNESCO Global Geopark Comarca Minera, Omitlán de Juárez is one of the nine municipalities comprising this territory. Thanks to its diverse landscapes and the commitment of its inhabitants to conserving geological, natural, and cultural heritage, it is recognized as a community actively engaged in sustainability efforts.

Omitlán currently has one recognized geosite: La Piedra del Comal and Peña del Diablo. Today, driven by the initiative of its inhabitants, we propose the Historic Center as a new cultural-interest geosite, where collective memory is both recreated and preserved in every space filled with meaning for the population, in each historic house that gives its architecture a unique character, in the Callejón del Dicho (the Alley of Sayings), in its baseball stadium, and its community gatherings, social life, and identity.

During the mining era, a significant portion of the workforce in the Real del Monte mines originated in Omitlán. Underground, they developed unique communication methods, such as the distinctive whistle (*chiflidito*), and shared a simple and nutritious meal, the traditional bean tacos (*taquitos de frijol*). Both customs have endured; whistling can still be heard in the streets, and bean tacos are sold in the town center as a taste of living history. Another expression of local identity is its traditional sayings, which are a source of community pride, each one linked to its original creator.

In the Historic Center lies the Callejón del Dicho, a pedestrian street flanked by long walls displaying murals of individuals who have enriched oral tradition with their sayings of traditional cooks and figures from the most popular sport in town: baseball, whose stadium is also located in the town center.

Its market, main square, and garden are gathering points where the community and visitors come together. Depending on the season, local geoproducers offer mushrooms and cahuiche, jams, fruit wines, and maguey pulque. All traditional culinary ingredients that demonstrate the connection between geodiversity and gastronomy.

Surrounded by a majestic natural environment, the town center inspires artists and offers adventurers a diverse and exciting landscape, with its legends captured in mosaics.

The Omitlán Historic Center combines cultural heritage, biodiversity, and gastronomy in a single space, embodying the values of UNESCO Global Geoparks. Its recognition as a geosite will contribute to community pride and respect for its heritage, attract geotourism, strengthen local identity, and promote sustainable development, drawing those who seek authentic experiences that connect nature, history, and community.

COMMUNITY-LED GEOTOURISM PRODUCTS & ARTISAN ENTREPRENEURSHIP IN LANGKAWI GEOPARK

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Keyword: geotourism, community, geopark

The success of Langkawi's geotourism product is inseparable from the active participation and empowerment of its local community. Since being designated as a UNESCO Global Geopark in 2007, Langkawi has implemented a "people-centered" geotourism approach, ensuring that economic, cultural, and educational benefits flow directly to residents. Economically, geotourism has created diverse livelihood opportunities, from guiding and boat services to hospitality, handicraft production, and culinary ventures. The Geopark Product program has been pivotal, showcasing locally made products such as traditional herbal remedies, woven crafts, and geopark-themed souvenirs. This not only sustains traditional knowledge but also increases household incomes, especially in rural villages surrounding key geosites. The Zero KM Geogastronomy initiative further boosts local agriculture and fisheries by promoting fresh, locally sourced ingredients in tourism dining experiences.

Socially, geotourism has strengthened community pride and cohesion. Residents take an active role as "geostewards," leading conservation activities such as mangrove clean-ups, coral reef rehabilitation, and heritage storytelling tours. Folklore and legends—like the tale of Dayang Bunting Lake or the geological rivalry of Mat Cincang and Mat Raya—are passed down through guided storytelling, reinforcing cultural identity while enriching visitor experiences. Empowerment is another significant outcome. Many women have emerged as entrepreneurs through small-scale tourism businesses, artisanal workshops, and eco-guiding services. Training provided by the Langkawi Development Authority (LADA) and geopark partners equips locals with skills in sustainable tourism operations, marketing, and environmental management, enabling them to compete in higher-value segments of the tourism market.

Importantly, the economic benefits of geotourism in Langkawi have proven more resilient compared to mass tourism. Because the geopark model focuses on smaller-scale, experience-driven activities rather than high-volume, low-cost packages, it distributes income more evenly across the community and reduces overdependence on a few large operators.As a conclusion, Langkawi's community-based geotourism model demonstrates that with strong local involvement, clear benefit-sharing mechanisms, and continuous capacity-building, geotourism can be a sustainable driver of both prosperity and cultural preservation.

FIRST GEOPARK EXPO: BIOCULTURAL HERITAGE AND COMARCA MINERA GEOPRODUCERS

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Keywords: geoproducers, biocultural heritage, SDGs, Geopark Guardians

The Comarca Minera Geopark Expo is a milestone in raising the visibility of the biocultural heritage of the territory. The protagonists of this event are geoproducers: traditional cooks, artisans, confectioners, bakers, cheese makers, and producers of soap, jams, wine, maguey, pulque, and distilled beverages. The event brought together over 2,500 attendees, including residents and tourists, who discovered and purchased products that reflect the identity and sustainable practices of the Geopark.

The event was made possible thanks to the commitment of the Geopark Guardians, volunteers representing the Geopark in each of its municipalities, trained in the principles of the "UNESCO International Geoparks Programme." They collaborate in the conservation and promotion of geological, natural, and cultural heritage, as well as in geoeducation and local management processes. For the Geopark Expo, the Guardians compiled directories of local geoproducers, coordinated with local authorities on permits, requirements, and invitations, and promoted the event within their communities. The host Guardians from Omitlán de Juárez organized a cultural program featuring musical performances, dramatized legends, and traditional songs, highlighting the importance of preserving knowledge and pride in heritage.

During the event, the connection between the Sustainable Development Goals (SDGs), everyday cultural practices, and the responsible use of natural resources was emphasized as essential to promoting the sustainable development of communities. For exhibitors, this experience marked a shift in their perspective. They stopped seeing themselves as sellers and began to recognize themselves as key actors in regional development, enthusiastically embracing the term "Geoproducer." The success of the event was reflected in sales and the growth of a community of geoproducers proud of their role within the Geopark. Today, geoproducers and service providers who maintain sustainable and traditional methods receive a plaque as "Proud Partner of the Geopark," while progress continues with the Secretaría de Economía of the State of Hidalgo toward the creation of a collective brand: **"Made in the Comarca Minera Geopark,"** which will provide identity, recognition, and added value to the products of the region**.**

The Geopark Expo became an opportunity for community recognition and empowerment, which demonstrates how a UNESCO Global Geopark can serve as a platform to highlight living culture and stimulate sustainable development processes based on respect for heritage and collaboration between sectors.

WOMEN LEADING THE WAY: EMPOWERMENT, INNOVATION, AND EARTH STORYTELLING IN THE QINLING ZHONGNANSHAN UNESCO GLOBAL GEOPARK

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Keywords: Qinling Zhongnanshan, UNESCO Global Geopark, Women's participation, female empowerment, community governance

As unique spaces integrating geological heritage conservation, science popularization and sustainable development, Global Geoparks have emerged as significant platforms showcasing female empowerment. Women play roles extending far beyond mere participants. As scientists, managers, educators, community leaders and entrepreneurs, they are profoundly shaping the development trajectory, cultural significance and social value of Geoparks. This paper examines the current state of female participation in the management and development of the Qinling Zhongnanshan UNESCO Global Geopark. It explores how women within global geoparks: Transform community stewardship into governance wisdom, evolve survival skills into cultural creativity and emerges as the most compelling storytellers of Earth's narratives.

IMABURA UNESCO GLOBAL GEOPARK: DIGITAL INNOVATION, ANCESTRAL KNOWLEDGE, AND STRATEGIC PROJECTS FOR INCLUSIVE AND SUSTAINABLE GEOTOURISM WITH A FOCUS ON SPORT AND OUTDOOR TOURISM

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Keywords: inclusive geotourism, ancestral knowledge, digital innovation, sustainable territorial management, community participation

The Imbabura UNESCO Global Geopark, designated in 2019, encompasses the entire province of Imbabura in northern Ecuador. It serves as a benchmark for territorial management by integrating geodiversity, biodiversity, and cultural heritage into a holistic model of sustainable development. The Geopark is administered by the Provincial Decentralised Autonomous Government (GAD) of Imbabura, in collaboration with the cantonal Decentralised Autonomous Governments and other local entities. This governance structure facilitates communication among authorities and, crucially, fosters direct engagement with the local communities who inhabit and safeguard the land—an essential factor for the effective protection and enhancement of its heritage. Community assemblies enable the exchange of knowledge, where ancestral wisdom is complemented by technical expertise in geodiversity, geological processes, cultural history, and conservation, presented in accessible language. This collaborative process generates educational and promotional tools designed to deepen heritage appreciation and highlight the territory's most emblematic sites with strong visual and narrative appeal. The ongoing cycle of identification, dissemination, and promotion sustains tourism and educational activities, provides tangible economic benefits for communities, and strengthens their sense of belonging and identity, encouraging active stewardship of the territory. The management approach combines digital innovation with the preservation and transmission of ancestral knowledge to reinforce inclusive, resilient geotourism—particularly in the sphere of outdoor and sport tourism. Activities promoted include trail running, hiking, open-water swimming in lakes, horseback riding disciplines such as endurance (long-distance equestrian competitions), cycling, downhill mountain biking, and others. The implementation of geo-routes through local communities empowers residents to take a more active role in local governance, increase their income, and diversify their economic opportunities. In parallel, the use of geospatial tools for navigation and interpretation in geosite environments—enriched with locally sourced information—ensures that digital resources are both technically accurate and representative of the territory's identity and intangible heritage. By integrating traditional knowledge, technological innovation, and sustainable development strategies, the Imbabura UNESCO Global Geopark consolidates its position as a reference point in comprehensive territorial management. This approach enhances resilience to future challenges, including climate change and the need for economic diversification, while safeguarding the province's rich heritage for future generations.

PATHS OF MEMORY AND STONE: CREATIVE GEOTOURISM AND LOCAL VOICES IN BARBALHA (ARARIPE UNESCO GLOBAL GEOPARK, BRAZIL)

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Keywords: creative geotourism, local development, Araripe Geopark

The Araripe UNESCO Global Geopark (UGGp), recognized for its outstanding geological and paleontological heritage, encompasses eleven geosites across six municipalities in Ceará, Brazil. This region also boasts rich natural and cultural assets, including the Araripe National Forest and the Chapada do Araripe—Ceará's first designated cultural landscape. In this context, the present work seeks to make known the development of a participatory and creative geotourism project focused on three geosites located in the municipality of Barbalha: Arajara Park, Mirante do Caldas, and Engenho do Meio. The initiative involved local communities and stakeholders through training in community-based tourism, creative itinerary development, and interpretive workshops, particularly targeting tour guides and tourism students from the Regional University of Cariri (URCA). These actions emphasized local perspectives on the territory, enabling residents and visitors to engage deeply with the scientific, cultural, and ecological values of the Araripe UGGp. Creative geotourism here functions not only as a tool for heritage interpretation and geoconservation but also as a platform for social inclusion and sustainable economic development. By valuing local knowledge and practices, the project aligns with the principles of action research and the goals of the International Geoscience and Geoparks Programme (IGGP), and with a particular focus on the Sustainable Development Goal 11 - Fostering Sustainable Cities and Communities. Ultimately, this approach aims to create a tourism model rooted in shared experiences, cultural identity, environmental awareness, and the generation of local income through sustainable entrepreneurship.

M'GOUN GEOPARK UNESCO, ENGINE OF THE TOURISTIC AND SOCIO-ECONOMIC DEVELOPMENT IN THE KHÉNIFRA-BENI MELLAL REGION

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Keywords: geotourism, sustainable development, community engagement, geological heritage, M'goun Uggp, Béni Mellal Khénifra

The M'Goun Geopark UNESCO, located in the heart of Morocco, is a prime example of how geological heritage can be harnessed to promote sustainable tourism and stimulate socio-economic growth in the Khénifra-Beni Mellal Region. This study aims to delve into the multifaceted role of the geopark, highlighting its unique geological features, community engagement initiatives, and strategic approaches to leveraging natural resources for the benefit of local populations.

The geopark encompasses a diverse landscape characterized by mountain ranges, deep gorges, and rich biodiversity, which collectively tell the story of the Earth's geological history over millions of years. This natural heritage not only attracts tourists but also serves as a foundation for educational and interpretive programs that raise awareness about the importance of conservation and sustainable practices. By displaying the region's geological significance, the M'Goun Geopark fosters a sense of pride among local communities and encourages them to participate actively in tourism-related activities.

Community engagement is at the core of the geopark's development strategy. This study will explore various initiatives aimed at involving local residents in decision-making processes, ensuring that their voices are heard and their needs are met. This participatory approach has led to the establishment of local cooperatives that promote traditional crafts, organic farming, and eco-friendly tourism services. By empowering local communities, the geopark not only enhances their livelihoods but also preserves cultural heritage and traditional practices that are integral to the region's identity.

The socio-economic benefits of the M'Goun Geopark extend beyond tourism. This study will highlight the positive ripple effects on local economies, including job creation in various sectors such as hospitality, and agriculture. By integrating tourism with local economic activities, the geopark contributes to a more resilient and diversified economy, reducing dependency on traditional livelihoods that may be vulnerable to external shocks.

The M'Goun Geopark UNESCO exemplifies how a well-managed geopark can serve as a catalyst for sustainable tourism and socio-economic development. This study provide valuable insights into the successful practices and lessons learned from the M'Goun Geopark, offering a model for other regions seeking to balance conservation with economic growth. By fostering community engagement and leveraging geological heritage, the geopark not only enhances the quality of life for local residents but also contributes to the broader goals of sustainable development.

A COMMUNITY LED-MODEL FOR SUSTAINABLE AND RESILIENT GEOTOURISM IN KHORAT UNESCO GLOBAL GEOPARL, THAILAND

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Keywords: Khorat UGGp, Geopark, Community-led model, Geotourism, Resilience

A UNESCO Global Geopark uses its geological heritage, in connection with all other aspects of the area's natural and cultural heritage, to enhance awareness and understanding of key issues facing society. By raising awareness of the importance of the area's geological heritage, UNESCO Global Geoparks give locals a sense of pride in their region and strengthen their identification with the area. The creation of innovative local enterprises, new jobs, and training courses is stimulated as new sources of revenue are generated through geotourism. At the same time, the geological resources of the area are protected. (UNESCO, 2025).

The case studies of Khao Chan Ngam, Din Kluea Phan Dung, Khao Yai Thiang, and the Thai Yuan community in the Khorat UNESCO Global Geopark collectively demonstrate a powerful, bottom-up Approach for sustainable and resilient geotourism. This approach centers on empowering local communities to become the primary stewards and beneficiaries of their geological, cultural, and natural heritages.

The community-led model is built on three key pillars:

1. Integrated Heritage Preservation and Utilization: This model is rooted in the active preservation of local heritage, where communities, often in collaboration with local institutions like temples and schools, safeguard their unique heritages—from prehistoric paintings and dry evergreen forests to traditional rock salt reserves. They cleverly integrate this heritage into a tourist experience, turning geological sites into interactive learning centers and cultural traditions into marketable activities. The result is a cycle where preservation directly fuels sustainable use, and vice versa.

2. Local Ownership and Self-Management: The success of this model hinges on community-led governance. By forming community enterprises, locals take full ownership of geotourism operations, including guiding services, managing homestays, and developing local products. This self-management ensures that the tourism narrative is authentic and that the benefits are distributed directly and equitably within the community. This decentralized structure builds resilience by reducing reliance on external actors and strengthening the community's capacity to adapt to changing conditions.
3. Diverse Income Streams and Community Development: The model generates resilience by creating a variety of income sources, moving beyond just ticket sales. Communities earn revenue from guided tours, sales of traditional handicrafts and local foods, as well as unique activities such as natural dyeing and spa treatments. Crucially, a significant portion of this income is reinvested back into the community for development projects, such as children's education funds and infrastructure improvements. This economic self-sufficiency not only improves the quality of life for residents but also reinforces the long-term sustainability of tourism model itself.

This community-led model in Khorat UGGp provides a robust blueprint for other geoparks seeking to create a form of geotourism that is not only sustainable and educational but also resilient, empowering local communities to thrive while preserving the very heritage that attracts visitors.

GEOTOURISM DEVELOPMENT WITHIN UNESCO GLOBAL GEOPARKS THROUGH LOCAL COMMUNITY ENGAGEMENT

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Keywords: geotourism, UNESCO Global Geoparks, community engagement, sustainable development, geoconservation

In an era increasingly characterized by sustainability demands, UNESCO Global Geoparks (UGGps) stand out as crucial environments where geotourism serves as a means for fostering environmental responsibility, empowering communities, and revitalizing economies. This doctoral research proposal examines the relationship between the development of geotourism and the involvement of local communities within geoparks, presenting a comprehensive framework designed to further the Sustainable Development Goals (SDGs). Rooted in a multidisciplinary perspective, the study investigates how community-driven strategies, participatory governance, and the enhancement of geoproducts and local cuisine can synergistically improve visitor experiences while safeguarding geological and cultural heritage.

At its essence, the project tackles the significant conflict between the expansion of tourism and the preservation of heritage. It asserts that the long-term viability of geoparks relies on genuine, grassroots participation from local communities, not just as recipients of benefits, but as active contributors to tourism narratives and guardians of their cultural and natural resources. Utilizing a mixed-methods research approach, which includes stakeholder interviews, community surveys, and comparative case studies from four distinct UGGps, the research aims to create practical resources such as a Community Engagement Toolkit and a Visitor Experience Enhancement Model. These outcomes are intended to shape policy, direct local initiatives, and function as replicable frameworks within the Global Geoparks Network.

This proposal presents itself at a crucial juncture where global challenges meet local opportunities, providing not just an academic contribution but also practical insights for geopark managers, policymakers, and community leaders. By highlighting the importance of collaboration, resilience, and cultural authenticity, it reconceptualizes geotourism as a transformative practice—one that has the potential to promote sustainable livelihoods, enhance visitor experiences, and strengthen our shared connection to the Earth's vibrant heritage.

REPORT ON GEOTOURISM AND SUSTAINABLE DEVELOPMENT IN FUNIUSHAN UNESCO GLOBAL GEOPARK

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Keywords: Funiushan UNESCO Global Geopark, geotourism, sustainable development, ecological protection, Science Education and Research Travel

As a landmark area marking China's North-South Geographical Divide and the watershed of three major river systems, Funiushan UNESCO Global Geopark possesses globally significant scientific value due to its dinosaur egg fossil clusters, granite landforms, and biodiversity resources. Based on UNESCO's core concept of "Conservation-Education-Sustainable Development", this report systematically analyzes the practical pathways of geotourism and sustainable regional development within the geopark. The park's practice demonstrates that the rational development of geotourism can promote regional sustainable development through three main pathways: economic stimulation, ecological protection, and community participation. However, it currently faces challenges such as conflicts between resource conservation and development, inconsistent infrastructure and service quality, and low international visibility. The study proposes countermeasures including innovating resource management systems, optimizing service quality, and strengthening international exchange and cooperation, providing theoretical reference and practical insights for the sustainable development of similar geoparks.

PRESERVING TRADITIONAL CRAFT VILLAGES ASSOCIATED WITH SUSTAINABLE GEOTOURISM DEVELOPMENT

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Keywords: traditional crafts, preservation, livelihood improvement, geotourism, sustainable development

Non nuoc Cao Bang UNESCO Global Geopark (CBUGGP) is home to different ethnic minority groups (Tay, Nung, Mong, Dao, San Chi, Lolo, etc.) whose distinctive and diverse cultures, traditional crafts are invaluable assets for the development of Geotourism. There are more than 20 craft villages in the Geopark territory such as incense making, traditional paper production, brocade weaving, forging and bamboo weaving, etc.

Preserving and promoting traditional craft villages associated with geotourism development and local livelihood improvement have been a key task of the Geopark's master plan. The Management Board of NNCB UGGp has been actively supported local craft villages in preserving their cultural values and transforming them into drivers of sustainable, community-based tourism, and in harmony with nature and environment. Noticeable examples can be seen in traditional paper and incense production villages, where the villagers have been supported to improve the quality of their products, packaging and diversify their products as souvenirs, and some households have begun welcoming visitors for experiential activities. The Geopark Management Board also places emphasis on advising local people to promote their distinctive cultural values, including customs, traditions, and architecture to develop more experiential activities for visitors. Capacity building on importance of preserving traditional craft villages, geotourism, interpretive and hospitality skills have been organized. Geopark partners, local people and villagers are becoming increasingly aware of their role and more engaging in preserving traditional crafts associated with responsible tourism development.

Despite positive results, the preservation and promotion of the craft villages for tourism development still faces many challenges. Most craft villages develop in a small-scale manner, mainly to serve the need of local market. The traditional products' designs are poor, and cannot compete with industrialized products. Insufficient attention has been paid to the preservation of traditional architecture in craft and ancient villages. Touristic activities in the craft villages have been initiated but at elementary level, incompatible with the potential.

The presentation will focus on examining the initiatives and efforts of CBUGGp in preserving and promoting traditional craft villages linked to geotourism development to create sustainable livelihoods and ensure equal community benefit sharing.

REGENERATIVE TOURISM IN A DYNAMIC LANDSCAPE: DEVELOPING EDUCATIONAL GEOTOURISM IN REYKJANES UNESCO GLOBAL GEOPARK

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Keywords: Reykjanes Geopark, regenerative tourism, geotourism, volcanic activity, educational travel

In response to recurring volcanic eruptions on the Reykjanes Peninsula, the project *"Regenerative Tourism in a Dynamic Landscape"* aims to transform natural challenges into long-term opportunities for sustainable, educational geotourism. Located within the Reykjanes UNESCO Global Geopark, the initiative leverages the region's exceptional geological features, ongoing geohazards, and accessibility to establish the area as a premier destination for international educational and research-oriented travel.

With a strong foundation in regional collaboration, the project engages Visit Reykjanes, GeoCamp Iceland, and the Reykjanes Geopark in a joint effort to attract specialized groups such as university field courses, research expeditions, and science-focused travel programs. These visitors bring not only economic benefits but also knowledge production and international networks. The project addresses the growing demand for immersive learning in geologically active environments, offering curated educational materials, risk communication strategies, and thematic itineraries.

Core components of the project include: (1) the creation of multilingual field guides and safety protocols, (2) targeted international marketing and academic outreach, (3) production of digital content and podcasts focused on volcanic processes and climate resilience, and (4) regional capacity building to support local guides and institutions in engaging with scientific visitors.

By aligning with the goals of the Geopark network, the project strengthens the identity of Reykjanes as a living geological classroom. It enhances geoscientific literacy, supports responsible travel, and promotes inclusive local development. Ultimately, this initiative contributes to the long-term resilience and visibility of the Geopark through a model of tourism that educates, respects, and sustains.

PRIVATE SECTOR ALLIANCES BOOSTING ENTREPRENEURSHIP IN THE SERIDÓ UNESCO GLOBAL GEOPARK

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Keywords: UNESCO Global Geopark, entrepreneurship, private sector partnerships, mining, renewable energy

Entrepreneurship is a driving force in UNESCO Global Geoparks, generating jobs within the creative and circular economy and energising their four core pillars: tourism, education, visibility, and conservation. Promoting it requires decentralised governance that mobilises not only public bodies but also private stakeholders capable of delivering infrastructure, initiatives, and events.

This study reports key contributions from private partners—especially mining and renewable energy companies—during the latest revalidation of the Seridó UNESCO Global Geopark. Actions, investments, and collaborations were systematically recorded and assessed.

Results show a diverse portfolio of impacts. Mining companies active in the Mina Brejuí and Açude Boqueirão geosites supported educational programmes, scientific research on metallogeny and geological heritage, and community tourism activities, including guided visits and staffing of museums and mining sites. A cement company sponsored the *Five Senses of the Seridó Geopark* programme, while wind energy firms funded geological and tourist inventory updates as part of environmental studies. ESG and environmental education initiatives financed geotourism training, and private investments enabled the construction of a new headquarters and interpretive centre for the Intermunicipal Public Consortium, plus interpretive spaces in traditional communities. Significantly, the combined efforts of these private investments culminated in the creation of the Seridó Geopark Agency, enhancing management capacity and strategic coordination.

These partnerships demonstrate that the private sector can be a decisive force in strengthening geopark governance, boosting local entrepreneurship, and delivering tangible socio-economic benefits. Embedding such collaborations into geopark strategies can secure long-term heritage conservation while accelerating sustainable territorial development.

SPORTS AND ADVENTURE TRAVEL IN CAÇAPAVA GEOPARK: 5 YEARS OF ACTIVITIES WITH GEODIVERSITY EMPHASIS

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Keywords: sustainable local development, geoconservation, geotourism, Caminho da Geodiversidade Gaúcha, Long-distance trail

Caçapava do Sul, located in the extreme south of Brazil, has been recognized by state law since 2015 as the Capital of Geodiversity and more recently, in 2022, received the seal of approval from UNESCO as a global Geopark. Obtaining these titles is due, firstly, to the enormous variety of rocks and relief forms in the region, mainly through the uniqueness, at a global level, represented by the Camaquã Basin. Precisely because of the geomorphological variety of the region, Caçapava do Sul and surrounding areas have historically been established as an important destination for sportspeople and tourists seeking to practice adventure sports in nature, such as hiking and trail running, orienteering, cycling, canoeing, hang gliding, climbing and rappelling. As geoeducation, geoconservation and geotourism actions developed, mainly from the beginning of the 2010s, there was always an attempt to relate the potential that the territory has in combining physical activity with knowledge of geobiosociodiversity. In the last 5 years, through the execution of extension projects linked to the local universities, in partnership with Guaritas Geotourism and rural landowners, a series of actions have been developed, always seeking to exchange knowledge and experience with the Caçapava community. Among the activities, the following stand out: i) 3 long-distance trails (trekking, lasting two days), in Serra do Segredo, Serra do Apertado and Guaritas, with the participation of 70 people and the contracting of food and accommodation services from several rural owners; ii) Day-long trails (hiking), mobilizing mainly the academic community, carried out in Serra do Segredo, Cascata Pedra Branca and Minas do Camaquã. Both hiking activities are linked to the "Caminho da Geodiversidade Gaúcha", a long-distance trail that emerged in this same context, following the regulations of the Brazilian Trail Network; iii) 3 orienteering races; iv) Rock climbing and rappelling activities, integrated with hiking, in Minas do Camaquã and Serra do Segredo; v) Climbing activities on an artificial wall, at Unipampa. As an important method used in the execution of all these activities, the constant search to contextualize the origin of the rocks and the formation of the relief where the different modalities are carried out stands out. Even during climbing activities on the artificial wall, practitioners learn more about how the rocks where rock climbing is carried out in the region were formed. With these actions, the knowledge and belonging of the academic and external community towards the geodiversity of the region has increased. Local sports and adventure travel entrepreneurs have also been encouraged to commercialize these activities, which provide a significant source of income, both for tour guides and rural owners.

SWOT ANALYSIS FOR LOCAL DEVELOPMENT STRATEGIES IN THE CAIUÁ GEOPARK

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Keywords: Cretaceous Fossils, Southern Brazil, community engagement

The establishment of Geopark Caiuá Project, which includes the municipalities of Cruzeiro do Oeste, Tuneiras do Oeste, Alto Piquiri, and Mariluz in Paraná, Brazil, represents a strategic opportunity to promote sustainable local development. This study identifies key strengths and challenges involved in advancing a project aimed at fostering sustainable development, geotourism, and the appreciation of natural and cultural heritage. The SWOT analysis is a widely adopted tool for assessing internal and external factors in strategic planning. In the case of the Caiuá Geopark Project territory notable strengths include the presence of internationally significant Cretaceous fossils and a natural landscape with high geotourism potential, both aligning with UNESCO's Global Geopark criteria. The region's geoheritage can serve as a catalyst for integrated territorial development by connecting science, tourism, culture, and education. Additionally, the region features rich cultural diversity, including Indigenous influences, enhancing the interpretive potential of the territory. However, weaknesses include limited tourism and technical infrastructure, insufficient local training in geoconservation management, and low public awareness of the Geopark concept. The absence of a consolidated governance framework and a lack of structured public policies further difficult project implementation. Opportunities include the potential to join the UNESCO Global Geoparks Network, attracting funding, international recognition, and technical support. Partnerships with universities, the private sector, and civil society organizations may foster technical capacity-building, job creation, and the promotion of geoproducts (locally branded goods linked to geoheritage). Threats, on the other hand, include unsustainable resource exploitation, real estate speculation, and unregulated land use, all of which may compromise the integrity of geosites. Political instability or administrative discontinuity at the local level may also jeopardize the continuity of long-term actions. Drawing on other Brazilian experiences such as the Araripe (CE) and Seridó (RN) Geoparks, it is evident that the success of a Geopark initiative depends strongly on coordinated local engagement, continuous strategic planning, and robust community participation. The SWOT analysis provides a clear framework for understanding internal and external variables, allowing for the maximization of strengths and opportunities while minimizing weaknesses and threats. The analysis reveals a favorable context for the establishment of a Geopark, with geological and cultural features that meet UNESCO criteria. However, structural challenges must be overcome, and collaboration among civil society, public authorities, and academic institutions must be strengthened. Through participatory planning and investment in infrastructure and environmental education, the Geopark has the potential to become a model for sustainable regional development.

GEOGUIDES AT THE OESTE GEOPARK: PARTNERSHIPS THAT CAN REALLY CHANGE THE LOCAL COMMUNITIES AND THE TERRITORY

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Keywords: geoparks, sustainable local development and geoturism

Since 2022, Oeste UGGp has a programme to promote people and local companies called "Geoguides". This certified training programme, which lasts 50 hours at the Level I and 72 hours at the Level II, has an official partnership with the National Tourism Office, through the Oeste School of Tourism and Hospitality, and it has already trained more than 150 people. The methodology used in the training is hybrid, i.e. 50 per cent of the course is taught online and the remaining 50 per cent is in person, on the field. The programme's target audience is tourism professionals or aiming to become one, municipal technicians, teachers, and the general public.

At the end of Level I, the trainees develop a theoretical exercise focused on constructing a tourist programme aimed at the natural and cultural heritage of Oeste UGGp. This programme is analysed and evaluated by the Oeste UGGp trainers on the course and also by the other trainees. At the end of Level II, trainees are asked to develop a tourist programme along the same lines as Level I, but with the task of simulating it on site. At the end of both Levels, trainees can market the programmes they have built and tested.

With a partnership with a mentoring laboratory - Oeste Respira, Oeste UGGp opened the opportunity to develop a joint strategy to encourage social entrepreneurship based on the territory's assets, through two initiatives: (1) including a social entrepreneurship module in the Level II "Geoguides" course; and (2) offering Vouchers for the business incubation programme at Oeste Respira.

The social entrepreneurship module will allow each tourism product or programme to be framed within a business model that considers economic, social and environmental value propositions. On the other hand, the vouchers will enable the geoguides and entrepreneurs to take part in a training programme that includes strategic positioning and communication, process management, financial management and social impact measurement. This strategy aims to enable participants to develop sustainable and innovative initiatives that combine the valorisation of natural and cultural heritage with the generation of positive social impact in the local communities of the Oeste UGGp.

ADVANCING GEOTOURISM AND COMMUNITY EMPOWERMENT IN ASPIRING LENGGONG UNESCO GLOBAL GEOPARK

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Keyword: geotourism, community empowerment, sustainable development

The Lenggong Valley, recognised as a UNESCO World Heritage Site in 2012 for its exceptional geoarchaeological heritage, is now progressing towards becoming a UNESCO Global Geopark (UGGp). The Aspiring Lenggong UGGp initiative integrates geological heritage, archaeological significance, cultural identity, and sustainable development through a comprehensive geotourism framework.

Central to this development are 15 geotrails designed to showcase the region's unique geoheritage and cultural landscapes. These geotrails provide visitors with immersive experiences, blending educational interpretation with recreational exploration. Supporting these initiatives, the Geoguide Programme has successfully trained 30 certified local geoguides, empowering the community to act as interpreters and ambassadors of Lenggong's natural and cultural heritage.

Significant efforts have been made to enhance the geopark's visibility and accessibility. Between 2022 and 2024, more than 50 infrastructure projects were implemented, including geopark signage, interpretation panels, upgraded geoheritage sites, and community-based accommodations such as homestays and chalets. Strategic events and festivals — involving more than 77,000 participants within three years — have further amplified public engagement and economic benefits. Additionally, the introduction of promotional tools such as the MEOT mascot, the Lenggong Geopark Gallery, and active digital media campaigns has strengthened brand identity and tourism outreach.

These efforts have yielded tangible results: tourist arrivals surged from 22,770 in 2022 to 154,137 in 2024, generating an estimated RM27.6 million in economic impact for the local community. Moving forward, the Lenggong Geopark Management Unit aims to expand geotrail packages, enhance geoguide competencies, and encourage sustainable investments through community participation, eco-friendly accommodations, and tourism innovation.

The Lenggong Geopark initiative underscores the importance of geotourism as a catalyst for socio-economic development, heritage conservation, and environmental stewardship. By integrating local communities into geopark planning and management, Aspiring Lenggong UGGp sets a strong foundation for achieving UNESCO Global Geopark status while contributing to the broader goals of sustainable development and global heritage preservation.

FROM LOCAL ACTORS TO GLOBAL STEWARDS: THE KEY ROLE OF YOUTH IN THE PROCESS OF DECLARING THE NAPO-SUMACO UNESCO GLOBAL GEOPARK

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Keywords: youth participation, territorial governance, geological heritage, sustainable development, case studies

This article analyzes the strategic role of youth in the process of declaring the Napo-Sumaco as UNESCO Global Geopark. The analysis rests on case studies and a review of key initiatives. It is structured around three main components: (1) emblematic projects led by youth for the valorization of geological and cultural heritage; (2) participatory processes in territorial governance; and (3) innovative advocacy mechanisms developed during the candidature phase. The findings indicate that actions conducted by young people—such as the creation of geoeducation spaces, awareness campaigns, research projects, and geoconservation activities—were decisive in consolidating the proposal before UNESCO.

Moreover, the article identifies three main lessons: (a) the capacity of youth to articulate technical and local knowledge; (b) their role as a bridge between community actors and institutions; and (c) their contribution to building a territorial identity around the geopark. The study presents a replicable framework for effective youth participation in geoconservation processes, with implications for public policy on sustainable territorial development.

ARTISTIC AND CULTURAL ACTIVITIES AND TOURISM AT GEOSITES

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Keywords: art, geo sight, tourism, local development

The cities of Toyooka and Tottori, located within the Geopark, hold annual theatre festivals. One of these, the Toyooka Theatre Festival featured a total of 132 programs from Japan and 7 counties, attracting 36,225 visitors last year. It is moving towards internationalisation. This festival notable for its unique approach, with performances taking place not only in theatres but also in hot spring towns, along the coast, on highlands, and on wooden rural stages set up within the grounds of shrines—essentially, throughout the entire city. The festival fully leverages the charm of the land, which overlaps with the San'in Kaigan Geopark, while also delivering a program that meets the expectations of theatre enthusiasts nationwide.

While providing numerous opportunities to watch performances, the festival also encourages local residents and tourists to explore the area at their own pace, discovering delicious local cuisine, famous hot springs, and breathtaking landscapes along the way. In line with this concept, last year, the Geopark Promotion Council, the theatre festival executive committee, and a local bus company collaborated to create a program that included not only performances at geoparks but also quiz competitions about geoparks on buses, which were very popular.

Final destination of the tour, local people who had undergone training under professional guidance performed at Genbudo Park, which was lit up , one of the IUGS Geological Heritage Sites. The audience and the natural stage became one, and the entire venue was filled with emotion.

This tour that it is possible to transform the Geopark from a place of learning into a stage for experience, simultaneously advancing tourism, education, and regional revitalisation. Going forward, we aim to expand our activities beyond Toyooka to include the theatre festival in Tottori City, which is within the same area, or collaborate with other Geoparks, and by conducting cultural and artistic activities at Geosites, we seek to build a new form of sustainable tourism.

Also, this year's theatre festival will feature performances related to other Geoparks (aspiring) in Toyooka, and our association will also be sponsoring the event.

CYCLING TOURISM IN THE UNZEN VOLCANIC AREA UNESCO GLOBAL GEOPARK

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Keywords: cycling tourism, sustainable development, local partnerships, infrastructure, geo-tours

In recent years, the Unzen Volcanic Area UNESCO Global Geopark has embraced cycling tourism as a strategy to promote sustainable development and connect people with the geological and cultural heritage of the Shimabara Peninsula. The initiative is led by the Shimabara Peninsula Tourism Board, with support from the Geopark Council, Nagasaki Prefecture, and the three municipalities: Shimabara City, Unzen City, and Minamishimabara City. Together, these stakeholders aim to build a low-impact tourism model that encourages longer stays, repeat visits, and a positive economic impact.

At the center of this effort is the transformation of the former Shimabara Railway Line into a dedicated cycling and pedestrian road. This ongoing project is part of a broader movement to create safe, scenic, and accessible cycling infrastructure across the Shimabara Peninsula. Backed by local governments and community groups, major sections of the route are already open, offering visitors a mix of natural, cultural, and geological sites along the way.

The project's name, *Ikomon*, meaning "Let's go!" in the Shimabara dialect, was selected through a contest involving local high school students, reinforcing a sense of local identity and community ownership. To support both domestic and international visitors, the project has developed bilingual cycling maps, a dedicated website, and promotional videos. Each city offers rental and electric bikes, while hotels, shops, and tourist sites are equipped with basic repair tools, air pumps, and bike racks. Trial rides and public events help encourage cycling among residents, promoting healthier habits and offering alternatives to car use, especially in a region with an aging population.

Despite clear progress, the project still faces several challenges. Local bicycle use has declined due to an aging population and car dependency. Coordinating efforts across three municipalities requires constant communication, and ensuring consistent signage and services remains complex. Attracting international cyclists will also require stronger multilingual resources and more effective promotion outside Japan.

The Shimabara Peninsula is now working toward designation as a National Cycle Route (NCR), a title granted by the Japanese government to highlight cycling routes of national and international importance. While six NCRs currently exist in Japan, none are in Kyushu, the southern island of Japan. Earning this status would raise the peninsula's profile, attracting more long-distance cyclists and international visitors. Future plans include guided geo-tours and closer collaboration with local businesses to expand cycling-related services. Cycling tourism is expected to become a lasting pillar of sustainable tourism in the Geopark.

ENTÔ: A GEO-HOSPITALITY MODEL ADDRESSING LOCAL CHALLENGES THROUGH GEOTOURISM IN OKI ISLANDS, JAPAN

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Keywords: geotourism, remote island tourism, sustainable regional development

The Oki Islands UNESCO Global Geopark, located in the Sea of Japan, is composed of four inhabited islands with unique geology, culture, and a population facing the typical issues of depopulation, aging society, and limited financial resources. In 2021, the region opened **Entô**, the world's first "geo-hotel" located directly within a UNESCO Global Geopark. Entô was designed not only as accommodation but as a gateway for immersive geotourism, linking visitors directly with the geological heritage, history, and community of the islands. It functions as a hospitality hub offering on-site geo-exhibits, guided experiences, and local narratives rooted in deep time and daily life.

While Entô was introduced by our team at the 10th International Conference on UNESCO Global Geoparks in Morocco, this presentation will expand upon its role in catalysing new models of sustainable geotourism and regional cooperation. One notable development is a new partnership agreement between Entô and Plaza Hotel, located in Okinoshima Town on a neighbouring island. Rather than viewing each other as competitors, the two facilities collaborate to offer a multi-night travel itinerary spanning all four inhabited islands, connecting guests with local guides, distinct geological sites, and community encounters. This approach exemplifies a shift from isolated tourism experiences to a networked geotourism ecosystem.

Entô's success in attracting visitors has stimulated the local tourism economy, which may help strengthen the sustainability of regional efforts such as geopark education and community engagement. Moreover, Entô's presence has drawn young people to work in geotourism and related industries, contributing to the resilience of a remote island region. Operated by a local social enterprise, Entô also reinvests its profits into sustaining traditional industries and developing regional products, making it a practical model of geotourism-driven regional revitalization.

However, challenges remain. Unlike some European geoparks where local farmers, café owners, and accommodation hosts are empowered as storytellers of geology, our interpretation efforts are still centralised. This presentation will reflect on how Entô can inspire broader community participation in geo-communication and explore how small islands can offer replicable, place-based solutions to global geotourism challenges.

THE IMPACT OF OUTDOOR SPORTS DEVELOPMENT ON ECONOMIC GROWTH IN M'GOUN UNESCO GLOBAL GEOPARK, MOROCCO

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Keywords: outdoor sports, sustainable development, M'goun UNESCO Global Geopark, community engagement, economic growth

The M'goun UNESCO Global Geopark, nestled in the breathtaking Atlas Mountains of Morocco, serves as a prime example of how outdoor sports development can drive economic growth for local guides and communities. This research investigates the multifaceted benefits of outdoor sports initiatives, including trekking, climbing, rafting, kayaking, trails, and mountain biking, and their contributions to sustainable economic opportunities, community engagement, and cultural heritage preservation. Outdoor sports have gained significant popularity in recent years, attracting both national and international tourists to the M'goun region. The unique geological features, stunning landscapes, and rich cultural narratives of the area provide an ideal backdrop for various outdoor activities. As a result, the geopark has become a hub for adventure tourism, offering a range of experiences that cater to diverse interests and skill levels.

The integration of outdoor sports into the geopark's tourism offerings has led to increased employment opportunities for local guides and community members. Many individuals have transitioned from traditional livelihoods, such as agriculture and livestock herding, to become certified outdoor sports guides. This shift not only provides a stable source of income but also empowers individuals by equipping them with valuable skills and knowledge. Training and capacity-building programs have been established to enhance the competencies of local guides, ensuring they are well-prepared to meet the needs of tourists while promoting safety and environmental stewardship. Moreover, the economic impact of outdoor sports development extends beyond direct employment. Local businesses, including accommodations, restaurants, and equipment rental services, have benefited from the growing tourism sector. As visitors flock to the geopark for outdoor adventures, they contribute to the local economy by spending on various services and products. This economic activity fosters a multiplier effect, generating additional income and employment opportunities for community members.
Community engagement is a vital component of the outdoor sports development strategy in the M'goun UNESCO Global Geopark. Local stakeholders, including community leaders, guides, and tourism operators, have collaborated to create a sustainable tourism model that reflects the values and priorities of the community. This participatory approach ensures that the benefits of outdoor sports development are equitably distributed, fostering a sense of ownership and pride among community members. By involving locals in decision-making processes, the geopark promotes initiatives that align with the community's cultural heritage and environmental conservation goals.

Furthermore, outdoor sports development in the M'goun region plays a crucial role in preserving cultural heritage. As guides share their knowledge of traditional practices, local history, and cultural narratives with visitors, they contribute to the promotion and appreciation of the Amazigh culture. This cultural exchange not only enriches the visitor experience but also reinforces the importance of safeguarding the region's unique heritage for future generations.

#CONCIENCIADELRIO: COMMUNITY ALLIANCES FOR RESILIENCE, CONSERVATION AND GEOTOURISM IN THE CAUTÍN RIVER BASIN, CURACAUTÍN, CHILE

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Keywords: community alliances, sustainable local development, geotourism, education & nterpretation, conservation governance

We are a community-led initiative from Curacautín that self-organized to care for and defend the Cautín River in a context of proposed hydropower projects and limited community participation in decision making. #CONCIENCIADELRIO means "River Awareness" in English and is a deliberate double meaning: raising awareness (CONCIENCIA) of the river we live beside and doing it "with science" (CON CIENCIA), through citizen monitoring and open collective learning. Our platform emerged from neighborhood assemblies and quickly evolved from opposition to proactive stewardship rooted in education, recreation and data.

Alliances are the backbone of our approach. By collaborating with river defenders from other basins (Ñuble, Alto Biobío, Pucón), we adopted the "Escuelita de Río" methodology: short to multi-day workshops on the river that combine basic whitewater safety and self-rescue, introductory paddling in kayak and raft, and participatory interpretation of local biodiversity and geodiversity, together with dialogue on cultural and recreational river uses. This inter-basin network made it possible to establish relevant and replicable educational practice.

These alliances catalyzed a geotourism pillar focused on local jobs and safety standards. In partnership with volunteers, local youth trained and achieved professional rafting guide certifications through the International Rafting Federation (IRF). The Municipality of Curacautín now hosts popular community rafting runs operated by these local guides, strengthening inclusive access, quality standards and a resilient, place-based rafting industry.

We also co-created geoeducational experiences and interpretive narratives that connect avifauna and native forests with mega volcanic eruption outcrops and glacial landforms visible along the Cautín. Through participatory water monitoring we documented seasonal dynamics—water level differences of up to ~2 meters between winter and summer, and temperatures from ~3 °C in winter to ~15 °C in summer—supporting risk awareness and outdoor learning.

Our conservation practice is alliance-driven: community organizations, the Municipality of Curacautín and the Kütralkura UNESCO Global Geopark management team collaborate to advance participatory river governance. Our main lesson is simple: durable, multi-actor alliances—with community groups, schools, tour operators, indigenous communities and local authorities—are essential to move from conflict to long-term, locally rooted conservation, education and sustainable development.

LICHENS OF KÜTRALKURA, FROM BASIC SCIENCE TO SUSTAINABLE TOURISM THROUGH ENVIRONMENTAL EDUCATION

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Keywords: lichens, diversity, Kutralkura, indicator species, Conguillío National Park

Lichens are one biological group extraordinary diversity, ecological functions, traditional uses, and potential applications are still poorly understood by both the scientific community and the public. In Chile, this knowledge gap is especially pronounced in ecologically significant areas such as the Mediterranean and temperate zones, including the Kutralkura UNESCO Global Geopark. Despite their presence across diverse habitats, lichens have been historically overlooked in research, resulting in a persistent lack of data and regional expertise.

Parque Nacional Conguillío, located within the Kutralkura UNESCO Global Geopark, is one of the most lichen-rich areas in Chile. This exceptional diversity results from the convergence of geological complexity and varied vegetation types, particularly the dominance of *Araucaria araucana* forests. The discovery of *Bryoria araucana* (Boluda, D.Hawksw. & V.J.Rico), a new endemic lichen species found exclusively on *A. araucana*, exemplifies the hidden biodiversity of this region.

This presentation summarizes the outcomes of two research projects carried out in Conguillío National Park, both funded by the Chilean National Agency for Research and Development (ANID). The first focuses on the lichen diversity associated with *A. araucana*, analyzing species composition in relation to microclimatic conditions and bark properties. This includes comparative assessments of lichens distribution along the tree trunk and presence on other phorophytes. The second project, currently ongoing, investigates the distribution of species of the genus *Menegazzia*, aiming to evaluate their potential as bioindicators of climate change due to their specific ecological preferences and restricted distribution patterns. Both studies have incorporated microclimatic monitoring using iButton sensors to record temperature and humidity, enabling a detailed understanding of the environmental conditions shaping lichen distribution and functional traits.

Beyond academic knowledge, these projects have contributed to building local capacities through collaboration with CONAF park rangers. Specialized workshops have trained rangers in lichen ecology and identification, enabling them to engage in high-quality environmental education for park visitors. Furthermore, the knowledge generated has been transferred to local ecotourism actors, including the association Corazón de Kutralkura and professional nature guides, who now integrate lichens into their interpretive narratives of both forest and geological landscapes.

Through this integration of basic scientific research with education and sustainable tourism, we aim to highlight the ecological and cultural value of lichens in the geopark context. Promoting awareness and appreciation of these often-overlooked organisms enhances the natural heritage of the park and supports its mission as a UNESCO Global Geopark, linking conservation, local development, and education.

FORMS OF ENCOUNTER BETWEEN PERMANENT RESIDENTS AND VISITORS: ARCHITECTURE AS A MEANS OF INTERACTION IN THE KÜTRALKURA GEOPARK

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Keywords: architecture, sustainable tourism, natural and cultural entities, associativity, new ruralities.

The article presents the experience of the Architecture Workshop of the Catholic University of Temuco, held at the UNESCO Global Geopark Kütralkura, in the Araucanía region of Chile. Using a multiscale approach, the workshop proposed to study the ways in which the permanent lifestyles of the area's inhabitants—mostly Mapuche—interact with the new dynamics associated with the geopark, with the aim of formulating architectural projects capable of integrating the questions that arise from this territorial and cultural complexity.

The study area focused on the Maichín River basin, between Kurarrewe and the Sollipulli volcano, an area characterized by scattered rural life in diverse human settlements. The workshop took place over two consecutive semesters, based on trips to the territory using direct observation methodologies, interviews, mapping, and critical surveys of the built environment. This work allowed us to build a detailed understanding of the selected places at different scales, in order to investigate their different ways of life, their systems of exchange, and the way in which culture and landscape are articulated within them.

The underlying vision was articulated around Josep Parcerisa's ideas about the interrelationships between natural and cultural entities. The architectural project was conceived not as a technical response to a given commission, but as a way of raising questions through drawing and recording different temporalities, uses, and ways of inhabiting. By avoiding the establishment of a predetermined architectural program, students were encouraged to listen actively, allowing them to construct a relevant question based on their knowledge of the place.

One of the relevant findings was the close relationship between annual climate cycles and productive activities, which is key to understanding a set of material and immaterial variables associated with settled families. The existing buildings are dynamic, reflecting a vital link between the family economy, the occupations of the people who make up the group, and the natural environment. This reality promotes partnerships between families or close-knit groups, based on complementarity and productive diversity as critical mechanisms for sustainability and permanence in the territory.

In the workshop, students sketched architectural projects that articulated local ways of life with the new demands of the geopark, considering tourist flows as a secondary and complementary aspect to the processes of natural and cultural enhancement. The notion of multiprogramming prompted the proposals to address the scales of domestic, community, and landscape use. The experience highlights the relevance of architecture as a tool to produce knowledge in a context of great cultural and natural value. Architecture would allow reflection, through the project, on existing ways of life and their interactions with the new instances of geological heritage conservation promoted by the Kütralkura Geopark, integrating the diverse knowledge of ancestral cultures into contemporary processes of territorial transformation.

GEOTOURISM AND ENTREPRENEURSHIP: POLICY-DRIVEN DEVELOPMENT IN THE KÜTRALKURA UNESCO GLOBAL GEOPARK

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Keywords: geoturisms, entrepreneurship, Global South, Indigenous Ventures

The Kutralkura UNESCO Global Geopark in Chile has emerged as a key public policy initiative designed to leverage geoparks as platforms for community-led geotourism and indigenous entrepreneurship, with the dual objectives of geological preservation and inclusive economic development. Its bottom-up governance model emphasizes local and indigenous participation, seeking to align tourism growth with community well-being. Consistent with prior empirical findings, geopark designations can revitalize rural economies by fostering new local entrepreneurial ecosystems, enabling the emergence of tourism-related ventures, generating employment through geotourism, and enhancing territorial welfare. While these entrepreneurial dynamics hold significant potential for local development, research on the specific barriers faced by such ventures within geopark territories remains limited. Moreover, there is a lack of context-specific policy recommendations for geoparks in the Global South—particularly those that account for the interplay of local and indigenous worldviews in Chile.

To address this gap, our study adopts a mixed-method research design that integrates semi-structured interviews with a Delphi method. The qualitative component consists of interviews with entrepreneurs operating within the Kutralkura Geopark, with a focus on identifying the key challenges to adopting and developing geotourism-based ventures. These interviews were conducted with members of the region's principal tourism association, which includes both indigenous and non-indigenous guides. To complement these insights, we employed a Delphi method involving regional tourism policymakers and local experts in tourism development from the Araucanía Region. Drawing on the triangulated findings, we propose tailored policy recommendations aimed at fostering regional development through the strategic alignment of global tourism opportunities with culturally grounded local perspectives. In doing so, this study provides the first systematic examination of geotourism entrepreneurship within the specific context of the Kutralkura UNESCO Global Geopark.
Based on these findings, we seek to contribute to the international conversation on how geoparks can serve as effective tools for local development, particularly when policies are responsive to the contextual characteristics of the territory. Future research could build upon our results by exploring potential economic mechanisms that link increased geoheritage awareness and natural conservation efforts within geoparks.

USING PROSPECTIVE THINKING TO CO-CREATE THE FUTURE OF GEOPARKS

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Keywords: future scenarios, co-creation, sustainability, future-making

Geoparks are natural resources of great relevance worldwide for their geological heritage and the potential they represent for local communities in terms of education, sustainable development, tourism and work associated with their conservation. However, in cases such as the Kutralkura Geopark in Chile, the park itself along with the geopark concept are not widely known, particularly when compared to other resources such as National Parks, which have other purposes and characteristics. Even among local communities the importance of the geological heritage that surrounds them can be unknown and in many cases its potential can be lost or irreparably damaged due to the lack of knowledge. Prospective thinking and futures design has gained momentum in recent decades as a structured planning approach that supports organizations and communities in decision making. Designing future scenarios considering political, economic, social, technological, environmental and legal trends, emulating classic strategic tools such as PESTAL, but focusing on the future and not the past or the present, brings significant advantages in changing, complex and highly uncertain environments such as the ones we live in today. Future-making emphasizes how organizational actors produce and enact the yet-to-come (Comi & Whyte, 2018; Wenzel, 2022). Our proposal is to show the potential of using future thinking methods, and especially the co-design of future scenarios with communities and relevant actors as a means to create diverse imaginaries of what geoparks can and should become in the near future, moving from focusing efforts on a probable future to a desirable future. Co-design represents an opportunity to plan and identify initiatives that promote local sustainable development and responsible tourism in which local communities are involved and empowered, modulating different variables and trends that contribute to the materialization of scenarios that bring the best benefits to the community and the geoparks from the environmental, social and economic perspectives. Tools such as generative AI have opened up new possibilities to make the co-design of future scenarios increasingly realistic and available to populations outside of technology or academia helping people visualize their ideas and the future they desire. In our futures design exercise, these emerging technologies represent an important opportunity to amplify our capacity and facilitate the creative processes that in some cases are obstacles to create representations of concepts with which we have little familiarity, such as geoparks. The methodologies applied allow us to use Kutralkura as a case study, that could later be used a reference to extrapolate this process to other geoparks around the world, identifying and incorporating local themes in each particular case to create future visions.

ARCHITECTURE AND CARING FOR THE KÜTRALKURA GEOPARK: THE EXPERIENCE OF THE WORKSHOPS OF THE UNIVERSIDAD CATÓLICA DE TEMUCO

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Keywords: conservation, architecture, education, sustainable development, Kütralkura Geopark

While architecture does not encompass all aspects involved in a Geopark, these are certainly within its scope, as architecture is concerned with inhabitation across all scales. Thus, a work of architecture must create connections between these scales: geography, detail, climate, lifestyles, construction, history, and economic activities. Inhabitation gives meaning to human existence through our relationship with the objects that surround us.

This paper describes the experiences of various workshops imparted by the FAAD-UCT School of Architecture in the Kütralkura Geopark. It considers the methodological aspects of using the territory as both a project space and as a situated pedagogical arena; it seeks to draw theoretical implications from this work and presents the results of these workshops: architectural projects that allow us to inhabit the territory with care and belonging.
Locating the workshops in the territory allowed teachers and students to reflect from different perspectives on the destiny of the place. To question this destiny is to ask about its role in our lives, and to properly value it we must understand it. Architects learn as much through study and field notes as through the preparation of plans and the execution of projects. Designing is also understanding, as every project contains a reflection of the place itself. Thus, a project must be understood as an essay. The Kütralkura Geopark places us on the edge of something that suspends everyday rules, typical constraints, and time. It is a place that is both spatially and temporally immeasurable. In it, we witness processes that take millions of years and ways of life that contrast with our haste and pursuit of efficiency. Its proximity is a gift; it enriches our view of the world and grounds us.

At the same time, the proximity of the Geopark makes it a vulnerable place, exposed to uncontrolled exploitation. A fragile place about which we should form an opinion and where we should establish paths to follow. Declaring it a Geopark is a great step forward for us as a society to focus on. It's not about prohibiting everything and preventing anything from happening there. Freezing it in time would impede the development of local economic activities and would alienate contact between different ways of life in our society. Indeed, freezing a culture means going against it.

Through the workshops, we discovered that connections between residents and visitors were essential. This is where we believe architecture, as a discipline, can collaborate and become a very valuable tool. Architecture is, by definition, a spatial link between different scales and timings involved in a project. The workshops held at the School propose, each in their own way, the creation of places that bring together the park's residents and its visitors, because the Kütralkura Geopark is a place that must be cared for by all.

EDUCATION, INTERPRETATION AND COMMUNICATION



UPDATE ON THE ERASMUS+ GEOSITE PROJECT

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Keywords: education, interpretation and communication

The GEOSITE-project is a cooperation between two Norwegian universities, three UGGp's and one aspiring UGGp in Europe. It aims to produce digital resources, including a website containing educational tools in natural science for students aged 8-16, and their teachers and to promote outdoor education as a whole. The tools are partly designed for each of the participating geoparks, and partly focused on general issues suitable for geoparks and schools anywhere in the world and outside the project.

The project started in October 2023, with the University of Western Norway (HVL), educating teachers, as the project manager. Funding is secured by Erasmus+, a program of the European Union. The University of Stavanger brings technical resources regarding digital tools development. The participating geoparks are the Joyce Country and Western Lakes Geopark in Ireland, The Buzău Land UNESCO Global Geopark in Romania, The Tuscan Mining UNESCO Global Geopark in Italy, and the Sunnhordland UNESCO Global Geopark in Norway. A thorough research in relevant schools in each of the participating geoparks was conducted at the outset, mapping the needs of the teachers dealing with natural sciences, and what their main difficulties are. The students' preferences when it comes to natural science teaching was also surveyed, and a broad review of existing digital educational tools in use by European UGGs has been published. During work meetings in Norway, Ireland, Romania and Italy, the specific goals and deliverables of the project were further defined, and regular digital meetings are conducted.

The finished product in 2026 will be a website in English and also the four national languages of the participating geoparks, where films, general- and special-designed tools for the geoparks will be available for anyone interested. The project is on schedule with a test of the website and resources conducted with several schools in every geopark during the school year 2025/26. The partners are currently defining the final dissemination meeting (summer 2026) and what a follow-up Erasmus+ project could look like to leverage wider use and effectiveness of the tools.

THE FIRST TERRA.KITA: A GEOPARK DAYCARE

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Keywords: Education for Sustainable Development, Sustainable Development Goals, Regional Collaborations

The Protestant-Lutheran Paulus Day Care Centre ("evangelisch-lutherische Paulus-Kindertagesstätte") in Melle is the first to be designated as a TERRA.kita within the TERRA.vita Nature and UNESCO Geopark in northwest Germany. "Kitas" (abbr. for "Kindertagesstätte") are a common German form of day care, and this collaboration follows the "Nature Park Day Care Centre" concept developed by the Association of German Nature Parks (VDN), of which TERRA.vita is a member.

The cooperation aims to promote Education for Sustainable Development (ESD), raise children's awareness of their local environment, and establish the Nature and Geopark as a space for learning and exploration. To meet the specific needs of a Geopark, the VDN's standard requirements were adapted: eligible day care centres must be located in a TERRA.vita community, not be large-scale facilities ("Großtagesstätte"), and must integrate the Geopark and TERRA.kita themes into their educational concept and public outreach. Each children's group must address a TERRA.vita-related topic at least once a year. These commitments are formalized in a cooperation agreement and reviewed annually. While the educational framework of Lower Saxony remains the foundation, TERRA.kita expands the curriculum with ESD principles and a strong regional focus. Children learn about the local geology, landscapes, nature, history, and culture. Activities include frequent excursions to geosites and natural areas and encounters with people practicing intangible cultural heritage and traditional crafts.In support, the TERRA.vita ESD coordination team provides teacher training, organizes parents' evenings, and supplies educational materials. Efforts are made to ensure low-barrier access to ESD, encouraging its integration across the entire curriculum. Following their training, educators reviewed their practices through the "Lens of ESD" and found they were already meeting many goals unknowingly, for instance the "Forest Week" teaching children on the forest ecosystem and soil, the library holding sustainability-themed books addressed to children, and the wild bee nesting box. Improvements have been made elsewhere: a tap water dispenser replaced bottled water, and children are more involved in self-awareness and hands-on learning, such as planting and harvesting vegetables in raised garden beds. A research station, equipped by TERRA.vita with discovery vests, magnifying glasses, and a whiteboard, was introduced. Teachers received workshops on the "Soil Suitcase" teaching material, and a forest education workshop was led by a TERRA.guide. TERRA.vita supports the day care beyond classroom activities. It participated in the summer party and included the centre in its education network, through which teachers receive newsfeeds on external training courses, funding opportunities, and network meetings. At parent evenings, the TERRA.vita ESD coordinators introduced families to the TERRA.kita program and shared tips on insect-friendly gardens and sustainable indoor plants. A flyer stand and future education projects – such as geology modules and a dinosaur project related to a nearby dinosaur tracksite – are also part of the initiative.

The certification enhances the centre's profile, increases teacher motivation, and strengthens regional identity. Children and families become more connected to their environment and are inspired to adopt more sustainable lifestyles, reinforcing the presence of the Nature and Geopark in everyday life.

GEOPARK-SUPPORTED EDUCATIONAL REVITALIZATION IN A DEPOPULATED REGION: THE CASE OF MUROTO HIGH SCHOOL IN MUROTO UNESCO GLOBAL GEOPARK

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Keywords: geopark education, youth engagement, depolarization, community revitalization, geopark collaboration

In a territory of Muroto UNESCO Global Geopark (MUGGp), which encompasses the entire Muroto City in Kochi Prefecture, Japan, there is only one prefectural high school — Muroto High School (MHS). Due to the declining population across Japan, particularly in Kochi , the prefectural government implemented a school reform policy two years ago. Under this policy, the number of classes and teachers is adjusted based on student enrollment. If MHS fails to maintain a minimum of 41 students per grade, it will be downsized from two classes to one. Continued decline could ultimately result in the school becoming a branch campus or even facing closure. This would leave the city without a high school, accelerating youth outmigration in pursuit of educational opportunities.

To counter this risk, MHS adopted the slogan “The High School Closest to Foreign Countries,” as part of their strategic initiative to attract students from outside the city. This approach has begun to show positive results, with increasing number of both local and non-local students and helping to sustain the school’s operation.

Behind this success, MUGGp has played a key role in two main ways. First, it supports formal educations by offering three unique subjects —“Muroto Study,” "Geopark Study,” and a “Project-based Learning Course” — all of which promote learning in collaboration with local community members and industries. Second, through informal education, MUGGp organizes international exchange programs with other geoparks via the Global Geoparks Network (GGN).

These learnings foster student growth in four key stages. First, students begin to see their region from a new perspective, developing curiosity and discovering the unique values of their local community. Second, through exchange programs, they broaden their minds and encounter practical ideas for building sustainable communities, which they then consider applying to their own region. Third, they start thinking seriously about the future of their community. Finally, they take concrete actions to contribute to it.

These opportunities not only connect students with the wider world but also nurture the students’ civic pride and affection for their community. As students show their posture being very active in volunteer activities and community events, this not only boosts their confidence but also motivates local residents to take pride in their youth. This, in turn, enhances the appeal of Muroto High School and helps attract more students.

This collaboration clearly demonstrates how geoparks can play a vital role in supporting sustainable education and regional revitalization in depopulated areas.

A FRAMEWORK FOR EFFECTIVE SCIENCE COMMUNICATION IN UNESCO GLOBAL GEOPARKS

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Keywords: science communication, public engagement, science communication framework

Effective science communication is central to the mission of UNESCO Global Geoparks (UGGps), yet systematic approaches that address their unique challenges are still limited. Geoparks are increasingly recognized as leading institutions in geoscience communication, making significant efforts to bridge science and society through the development of engaging materials and activities. However, the focus on specific tools such as panels, brochures, trails and virtual resources often overlooks the broader strategic dimension of communication. This abstract introduces the first structured framework specifically designed to support science communication and public engagement in UGGps.
Building on prior research and comparative case studies, the proposed framework includes 18 principles grouped into five key dimensions that reflect the multifaceted nature of communication within Geoparks. These dimensions address key aspects such as strategic foundations for planning and resource allocation, audience-focused communication, engaging and innovative approaches, trust-building through scientific integrity and responsibility and continuous evaluation to ensure lasting impact. Rather than serving as a "magic recipe" or prescribing a one-size-fits-all approach, the framework offers a cohesive and adaptable model that supports long-term impact and continuous improvement, without striving for uniformity or standardization.

To test the framework's relevance, a comparative analysis was conducted by aligning diverse science communication indicators with the principles, allowing an assessment of the framework's coherence, scope and applicability.

The framework aligns with the mission and Operational Guidelines of UGGps, is grounded in local contexts, and recognizes Geoparks as dynamic platforms for engaging communities with geoscience, geodiversity and geoconservation. It emphasizes the importance of connecting scientific content to real-world concerns, such as geohazards, climate change, natural resources or environmental stewardship, through accessible and meaningful communication. This approach fosters active participation, cultural relevance and deeper societal engagement.

This study also contributes to the operational capacity of Geoparks by offering practical tools for planning, implementation, and evaluation of communication strategies. The principles outlined are applicable not only within UGGps but also across similar settings, including Biosphere Reserves, World Heritage Sites, protected areas and other contexts.

By framing science communication as a strategic and integrative component of Geopark management, this framework enhances the visibility and impact of Earth sciences, supports environmental education and reinforces the contribution of UGGps to the UN Sustainable Development Goals. It provides a foundation for improved public engagement, policy influence, and stakeholder collaboration, essential elements for advancing the role of Geoparks in today's complex socio-environmental landscape.

3DIMAGERY OF GEOHERITAGE – CONSERVATION MEASURES AND ANIMATIONS

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Keywords: 3D imagery, conservation, mediation

More and more 3D imagery is made for research activities or scientific dissemination purposes. The technological evolution and accessibility of high-tech instrumentation and software increases the 3D imagery by individuals. In the Famenne-Ardenne Geopark, citizen initiatives lead to the 3D imagery of several caves, among which the Hotton cave, one of the three important touristic caves of the Geopark. The Han cave, the most important touristic cave in the region, was scanned in a research perspective. Moreover, a 3D Anticline of Durbuy was made for science dissemination in the frame of the 2nd 100 world? UNESCO Geosites.

These digital replicas are interesting for their possibilities to better protect original sites, to foster interest for invisible geoheritage, to monitor eventual degradation of sites, to facilitate dissemination of information and enable immersive experiences and enable the creation of so-called digital 'twins, a combination of 3D and spatially referenced information (geochemical composition of the rock, etc…).

To obtain the 3D different techniques are possible: photogrammetry on drones, LIDAR, which are crucial in cave sites were no light is available.

Technically , difficulties and tips….
To make the use of the 3Ds possible for specific purposes, most of the time a cleaning with adequate software is needed and probably represent the most time consuming step.

Finally, the diffusion and the enabling of use of these acquisitions are interesting but have some challenges. Since the storage of these rather voluminous files need adequate structures. The geopark FA is looking for a partnership with the Institute of Natural Sciences in Brussels which has an important natural sciences collection. However, 3D files are a new type of collection item to which the institute has to adapt. The main difficulty is to choose the adequate file type and visualization software to make the collection item visible to all, besides the possibility to give the full original file on demand for more specific purposes.

In the frame of conservation purposes, the 3D permits to monitor eventual movements and potential degradations of the site. A first 'zéro state' 3D is therefore a first step to compare to, when there is a suspicion of change. For example, in the Han and Hotton caves, the 3D makes it possible to monitor changes related to block fall or changes in the rock screes to In a near future. or preserve the original, it enables the visitor still to have a 'kind of' access to closed sites, typically archaeological sites.

MAKING VILLUERCAS-IBORES-JARA UNESCO GLOBAL GEOPARK MORE VISIBLE IN EACH VILLAGE USING THE GEOPACA MASCOT AS A LINK BETWEEN THE GEOPARK AND ITS CULTURE, ECONOMY OR POPULAR FESTIVITIES

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Keywords: geoparks, sustainable local development and geoturism

The Villuercas-Ibores-Jara UNESCO Global Geopark is located in the autonomous community of Extremadura, Spain. It covers an rural area about 2500 km2 spread over 19 municipalities with 26 small population, less than 12.500 inhabitants between them, but preserving their traditions, and culture, economy, history heritage.
Geopaca is the mascot of the Geopark, she´s our GOAT. It was designed in the early years of the Geopark and has been a great success among schools. In fact, it was the students who gave it its name. This appreciation has given it visibility and it has become one of the links between municipalities and local society, even appearing in promotional and tourist activities.

Thanks to the Local Action Group APRODERVI LEADER project, a member of the Geopark Council, corporeal images have been designed of the mascot dressed in attire that reflects the idiosyncrasies of each municipality.
These structures are placed on all our municipalities, on the squares, councils, interpretation centres and are made in “hard” material. Also is a very good photo call especially to young people.
This communication will look at the link between the Geopark and the economy, culture, traditions, history and local heritage of each town using the different versions of Geopaca that are on display.

It is a way of appreciating the context in which the Geopark develops and which it is obliged to preserve and strengthen.
Alía: Olive grower. Aldeacentenera: Discoverer. Berzocana: Archaeologist. Cabañas del Castillo: Goatherd. Campillo de Deleitosa: Miner. Carrascalejo: Pilgrim. Castañar de Ibor: Mine Explorer. Cañamero: Grape picker. Deleitosa: Photographer. Fresnedoso de Ibor: Olive grower. Garvín: Olive grower. Guadalupe: Pilgrim. Logrosán: Miner. Navatrasierra: Beekeeper. Navezuelas: Farmer. Navalvillar de Ibor: Astro-tourism. Peraleda de San Román: Olive grower. Robledollano: Shepherdess. Valdelacasa de Tajo: Shepherdess. Villar del Pedroso: Sergeant of the Carnival of Souls.
The whole gives rise to a brief account in which we could highlight that the Villuercas-Ibores-Jara UNESCO Global Geopark is located in a historic territory, where traces of the first settlers and agricultural and livestock settlements can be seen, leading to a rich population and sites that form part of world heritage, such as the Monastery of Guadalupe, its pilgrimage routes and its global influence since XIII Century.

How the traditional economy has led to prestigious designations of origin such as oil, honey, cheese and wine, whose companies and cooperatives work side by side with the geopark. Of course, it is also a territory marked by its geological, mining and palaeontological heritage. A heritage in which mountains and valleys are home to the villages and resources that the geopark values. Villages that have finally adopted the geopark as a sign of identity, of which these Geopacas are just one symbol.

BERGSTRASSE-ODENWALD UNESCO GLOBAL GEOPARK RAISES AWARENESS FOR SOIL PROTECTION

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Keywords: geopark, education, communication, 2030Agenda, biodiversity, agriculture, nutrition

Soil is literally the foundation of our lives. Most of our food grows on it. When there is a lack of fertile soil, famines quickly break out. The soil stores and filters rainwater, absorbs large quantities of the greenhouse gas carbon dioxide, and is a habitat for numerous living creatures. Without intact soils, life on land would not be possible for humans and animals.

In Bergstrasse-Odenwald UNESCO Global Geopark, there are quite different types of soils that have been formed over thousands of years through the weathering of rock, deposits like loess, and the decomposition processes of organic materials by millions of microorganisms. Diverse types of rock, such as sandstone, granite, or shell limestone, have led to different types of soil, which have been used in different ways throughout history, e.g. for agriculture, forestry, or viticulture.

Due to intensive use and land consumption, our soils are in danger. Soil protection is therefore of particular importance especially for UNESCO Global Geoparks, which are model territories for the 2030 Agenda. Soil protection is included in **SDG 15** „Life on land".

To draw attention to the importance of soils for humanity, Bergstrasse-Odenwald UNESCO Global Geopark has developed various visualization and information tools. Soil protection also plays an important role in the **Education for Sustainable Development** programme of the UNESCO Global Geopark.

To promote the structure and importance of soils, Bergstrasse-Odenwald UNESCO Global Geopark already has almost ten **soil profile steles** at various locations within its region on display. A soil profile stele contains two typical soil profiles which were taken in the immediate vicinity of the stele's location. A display board provides information about the structure of the soil, how it is used, and it has been used over the course of history. Special attention is paid to soil as a carbon store and as a place of biodiversity. In the lower part of the stele, there is a peephole with a picture of the living world of the soil. It shows children the different inhabitants of the soil.
A further example for the visualization of the importance of soil is a total of five display boards in and around Heidelberg. The rich landscape - fertile fields, mixed forests, Neckar floodplains, former quarries and vineyards - bear witness to different types of soil. The **display boards** at various locations around the city now provide information about this.

In the **Educational for Sustainable Development programme**, the Geopark rangers take children and young people into the world of soils. With exciting activities and experiments, the children learn about the hidden diversity beneath the surface.

All these measures show how important it is to protect the soil, which has developed over a long period of time and is essential for local food production. In Bergstrasse-Odenwald UNESCO Global Geopark it is an ongoing process to draw attention to the importance of soil protection.

USING GEOPARKS AS A LEARNING ENVIRONMENTS FOR EDUCATION FOR SUSTAINABLE DEVELOPMENT: BEST PRACTICES FROM LESVOS ISLAND UNESCO GLOBAL (GREECE)

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Keywords: Lesvos Island UNESCO Global Geopark, Education for Sustainable Development, geoheritage, Sustainable Development Goals

Lesvos Island UNESCO Global Geopark serves as a learning environment for Education for Sustainable Development, leveraging its geological heritage to engage school students to the subjects of the Sustainable Development Goals in real-world learning experiences.

Educational initiatives implemented by the Natural History Museum of the Lesvos Petrified Forest, the management body of the Geopark, offer place-based educational programs for school students of all levels. These programs connect geological heritage to broader sustainability topics, including climate change, biodiversity conservation, responsible resource use, human-environment interactions.

The rich geological heritage of Lesvos Island UNESCO Global Geopark constitutes an excellent tool for in teaching fundamental local or global challenges. By linking local geoheritage to sustainability issues, the Geopark enables children to explore complex environmental and societal challenges while understanding their local and global significance. In parallel, helps children to develop critical thinking, problem-solving skills and a sense of environmental responsibility.

This paper presents best-practice educational programs implemented in Lesvos Island UNESCO Global Geopark, aiming to explore how geological heritage, when combined with educational infrastructure and active engagement, can effectively involve students in learning about the UN Sustainable Development Goals. Drawing on examples of educational activities, it highlights how such initiatives provide meaningful learning experiences beyond the traditional classroom setting.

By using local examples and fostering international collaborations, these programs offer students a rich context for understanding global challenges and contribute to the development of informed and active citizens.

NURTURING FUTURE GUARDIANS: THE IMPACT OF LANGKAWI GEOPARK'S EDUCATIONAL OUTREACH ON YOUTH AND COMMUNITY

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Keyword: geopark, education, community, sustainable

Langkawi UNESCO Global Geopark (LUGG), established as Malaysia's first and Southeast Asia's pioneering UNESCO Global Geopark in 2007, is a region of exceptional geological, ecological, and cultural significance. Spanning 99 islands in the Andaman Sea, the geopark offers a remarkable window into Earth's ancient history, featuring some of the oldest rock formations in Southeast Asia dating back over 550 million years. Beyond its geological wonders, Langkawi Geopark also encompasses rich biodiversity and a diverse cultural heritage, making it an ideal platform for integrated educational and awareness programs.

The educational and awareness initiatives of Langkawi Geopark form a core component of its mission to promote sustainable development through the conservation of natural and cultural resources. These initiatives are designed to engage a wide spectrum of stakeholders — including local communities, schoolchildren, tourists, researchers, and policymakers — to cultivate a deeper understanding of geosciences, environmental conservation, and cultural heritage.

One of the cornerstone programs is the Junior Geopark Guide Program, which trains local youths to become ambassadors of the geopark. Through this program, participants gain in-depth knowledge about Langkawi's geology, flora, fauna, and cultural history, equipping them to educate visitors effectively. This initiative not only enhances the visitor experience but also empowers local youth with skills, environmental ethics, and a sense of pride in their heritage.

Educational outreach extends to local schools where geopark themes are integrated co-curricular. Collaborations between the Langkawi Development Authority (LADA), educators, and environmental experts facilitate field trips, workshops, and interactive sessions designed to inspire curiosity and stewardship among students. These programs promote experiential learning, allowing students to directly observe and appreciate the geopark's unique features, fostering early environmental consciousness.

The geopark also hosts interpretive centers and informative signage across its three main geoforest parks — Machinchang Cambrian Geoforest Park, Kilim Karst Geoforest Park, and Dayang Bunting Marble Geoforest Park. These centers offer interactive exhibits, geological displays, and multimedia presentations that translate complex scientific concepts into accessible knowledge for diverse audiences.

In summary, Langkawi UNESCO Global Geopark's educational and awareness initiatives play a pivotal role in safeguarding its unique geological and cultural assets. Through inclusive, multifaceted programs that blend science, education, and community involvement, the geopark nurtures environmental stewardship and sustainable development. These efforts ensure that Langkawi remains a vibrant and resilient geopark, inspiring current and future generations to appreciate and protect Earth's heritage.

EMPOWERING EARTH SCIENCE EDUCATION THROUGH ACADEMIC.COMMUNITY.BASED STRATEGIES IN THE NAPO SUMACO UNESCO GLOBAL GEOPARK

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Keywords: geoeducation, knowledge mobilization, community engagement, intercultural dialogue, geotourism

The Napo Sumaco UNESCO Global Geopark (NSUGGp), located in the Ecuadorian Amazon, functions as a unique outdoor laboratory and living classroom for promoting Earth science education. As the first geopark in the Amazon basin, co-managed by more than 36 Kichwa (Napo Runa) and Quijos native peoples' communities and the Napo Sumaco Geopark Foundation (NSGF), the NSUGGp offers an ideal environment for implementing innovative geoeducation strategies that integrate intercultural territorial knowledge.

In 10 years of collaborative work, multiple educational initiatives have been implemented by researchers, teachers, students, and local stakeholders. These initiatives are based on a commitment to knowledge mobilization, participatory research, and mutual learning. The link between scientific research and community participation in the NSUGGp has become a strategic action for the empowerment of the local population, while strengthening the academic training and social responsibility of university students.

NSUGGp's educational activities encompass both classroom and field experiences. Geological features such as volcanic deposits, karst systems, and sedimentary successions are ideal spaces for learning, not only from a technical perspective but also because they facilitate the incorporation of narratives, interpretations, and ancestral knowledge of local inhabitants. The multiple territorial knowledge thus functions in the interpretation of geological materials and landscape evolution processes in situ, facilitating a more comprehensive and contextualized understanding of the Earth sciences.

One of the fundamental principles of this approach is intercultural dialogue and the mobilization of knowledge, emphasizing two-way learning. Rather than applying a top-down didactic model, participants in educational activities actively listen and learn from local knowledge holders, many of whom possess in-depth territorial knowledge about natural resource use and environmental transformations. This horizontal dialogue has created opportunities for shared knowledge building and strengthening the NSUGGp through community-based initiatives such as Minka and Turkana.

Awareness mobilization is achieved through educationally accessible products such as brochures, interpretive panels, and educational guides, among others. Outreach workshops, school visits, and presentations led by and for young researchers further expand the dissemination of geoscience information. They are produced and reproduced collaboratively and then tested in classrooms and field outcrops to assess their adaptability to various educational levels and cultural contexts.

Notably, these geo-educational initiatives are integrated into broader research and community engagement projects, supported by academia in collaboration with the NSGF. Degree theses, service-learning courses, and interdisciplinary projects have allowed students to interact directly with real-world challenges in the NSUGGp. Several students claim to have increased their motivation and sense of purpose by contributing to work of social and environmental importance.

These collective efforts described here reflect a strategic alignment with the objectives of the UNESCO Global Geoparks, especially in terms of strengthening education for sustainable development, fostering local participation, and protecting geological heritage. Furthermore, by positioning geological knowledge as the basis for the implementation of geotourism, geoparks reinforce both territorial identity and local economic opportunities. Finally, this experience demonstrates that education based on territorial knowledge, culture, and collaboration is not only possible but essential for building resilient and inclusive societies.

TIME ON THE TRAIL: EDUCATIONAL GEOWALKS THROUGH THE SCHELDE DELTA

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Keywords: education, time trail, geowalk, deep time

In the framework of Geopark Schelde Delta's educational mission, a new geologically themed walking experience has been developed at De Vroente, the Flemish government's visitor and environmental education center in Kalmthout. This educational walk is designed specifically for secondary school students and aims to connect youngsters with the concept of "deep time" by guiding them through the geological history of the region in a tangible and accessible way.

Through storytelling, interpretation, and interactive guidance, students are taken on a journey that explores the dynamic history of the Earth, from ancient marine environments and glacial periods to present-day landscapes. The walk highlights key geological features of the Kalmthout area, including sand deposits, peat layers, and subtle traces left by shifting sea levels and ice ages. These natural elements serve as teaching tools to help students understand complex geological processes in a way that links science to their local environment.

This initiative is not only about transferring geological knowledge, but also about fostering a sense of place and curiosity among young learners. The experience is led by local guides trained through their involvement with the educational center and Geopark Schelde Delta. These guides play a crucial role in interpretation, using storytelling techniques and hands-on activities to stimulate critical thinking and environmental awareness among students.

Building on the success of this student-focused approach, we are now adapting the walk for an adult audience. A second version of the guided walk will be launched at the Zwin Geosite, a coastal location known for its rich ecological heritage. The adult program will retain the core educational elements but will incorporate more detailed content, catering to participants with a broader interest in geology, climate history, and landscape evolution.

The dual development of these walks—one tailored to students and one to adults—illustrates our broader strategy for communication and education within the Geopark: using local landscapes as open-air classrooms where participants of all ages can connect with geological time, understand natural processes, and recognize the value of geoheritage in their own surroundings.
Importantly, this initiative also strengthens collaboration between Geopark Schelde Delta and local communities. The involvement of local guides not only ensures authentic and place-based storytelling, but also fosters local ownership and pride in the region's geological identity. These guides, having been introduced to the vision and scope of the Geopark, become ambassadors of geoheritage and lifelong learning.

In conclusion, this walking project exemplifies how education, interpretation, and communication can be effectively combined within a geopark context. By engaging different age groups through tailored experiences, we aim to build a deeper public understanding of geology and its relevance to past, present, and future landscapes.

REFRAMING TERRITORIAL MEDIATION THROUGH EDITORIAL NARRATIVES: THE GEOPARKS-TRAVELLER'S NOTEBOOK PROTOTYPE

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In the field of contemporary territorial interpretation, UNESCO Global Geoparks often struggle to fully activate the emotional and narrative potential of the territories they embody. The publications devoted to them remain largely confined to aesthetic yet unengaging formats: attractive picture books, accompanied by technical and heterogeneous texts lacking editorial coherence or narrative flow. Designed primarily for contemplation, they tend to be browsed rather than experienced, offering rich content that proves difficult to appropriate.

It is against this backdrop, and on the occasion of the GGN's 20th anniversary, that the GGN Executive Board initiated a bold editorial shift: the *Geoparks-Traveller's Notebook*. This project embodies a triple ambition — informational clarity, narrative structuring, and digital interoperability. Through this lens, Geoparks are promoted via a more sensitive, embodied, and profoundly human approach.

The *Traveller's Notebook* is built around the continuous voice of a fictional traveler (Gael Montoya), who journeys for nearly two years across the 229 UNESCO Global Geoparks in existence in 2025. His itinerary, geographically plausible yet poetically crafted, unfolds in a sequence of lived fragments — sensed atmospheres and intersecting reflections on geology, memory of place, and human encounters. Each page, dedicated to a single Geopark, follows a coherent scenography: an original watercolor inspired by a symbolic object or landscape (created via assisted creative AI), a sensitive and stylistically unified text, and a few key data points (geological dating, cultural uniqueness, lived moments). Each page is enriched by a unique QR code, granting access to a one-minute mobile video, the site's geolocation, and a direct link to the official Geopark portal.

This hybrid editorial device — printed book, digital interface, sensory experience — enables multiple modes of reading: linear, emotional, and exploratory. It combines accessibility, narrative immersion, and content richness, without resorting to oversimplification.

Over 1,000 media objects have been created by the editorial team at Zapall Design: texts, watercolors, QR codes, native videos, and navigation architecture. Together, they form a systemic storytelling of the GGN network — one that harmonizes formal unity with cultural diversity.
Conceived from the outset as an adaptable prototype, the *Geoparks-Traveller's Notebook* may be further developed — in partnership with Zapall Design — at the scale of an individual Geopark or within a national or regional network. This edition, dedicated to the entire GGN, is designed to allow seamless multilingual translation and offers strong potential for economic valorization (gift shop sales, educational use).

The *Geoparks-Traveller's Notebook* thus emerges as a renewed editorial object. It marks a methodological shift by emphasizing the activation of the desire to know, the power of sensory experience, and the progressive appropriation of Geopark territories. It offers a new form of presence within place — readable, interactive, immersive — profoundly aligned with the expectations of today's audiences.

INTERPRETING YOUR GEOPARK'S STORY: THE CRUCIAL BUT OFTEN MISSING LINK BETWEEN GEOSCIENCE AND VISITOR EXPERIENCE

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Keywords: communication, interpretation, geoscience, education, visitors

A clear interpretation strategy is key to developing an effective and positive visitor experience for every Geopark. It is also key in explaining your Geopark's significance to those who live within your geopark. However, few geosceintists (or other scientists) have been taught or have developed this skill, which requires a completely different means of communication than that used in scientific publications, geological field trips, and meetings. Key examples of pitfalls to avoid include: too much text on interpretative panels; overly complex diagrams that require a background in geology; reliance on concepts that are foreign to non-geologists, without explanation. An interpretive panel, for example, will not be read in full by everyone, especially if the text is too lengthy or complex, and by few with a geoscience background. So, consider your key 'take away' message, and how to capture the attention of the passerby. In this presentation, the Interpretation Strategy developed for Cliffs of Fundy Geopark will be shared and made available to sister Geoparks of the GGN family, using key principles of interpretation and examples of how to adopt 'better practice'. It is important in addition to include supplemental messages of importance to UNESCO Global Geoparks; these include references to the Sustainable Development Goals, safety messages and cultural acknowledgements. The challenges of meeting all of these varied needs on an interpretive panel can be met through careful use of symbols, imagery and text, all in an engaging design. The same principles apply to visitor maps, geotourism materials and guidebooks, none of which should be primarily written for geologists.

LANGKAWI'S REGIONAL COURSE ON MANAGING GLOBAL GEOPARKS: CONTRIBUTION TO THE CAPACITY BUILDING IN THE ASIA PACIFIC REGION

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Keywords: regional course, UGGp, capacity building, geopark managers

Langkawi UGGp has been organising the Regional Course on Global Geoparks since 2015. The 2025 conference will mark its 8th edition, themed, 'Geopark Networking and Visibility'. The primary objective of this regional course is to build the capacity of managers and technical staff from UNESCO Global Geoparks (UGGp) and aspiring UGGps in the Asia-Pacific region, particularly targeting geopark managers in ASEAN countries. To date, a total of more than 650 participants have attended this course, with past themes, including 'Effective Management for Better Geopark Future' in 2015, 'Standing in the Eyes of the World' in 2016, 'Geopark Development and Management' in 2017, 'Developing and Managing Global Geopark' in 2018, 'Geotourism and Community Participation' in 2019, 'Utilising Geosites for Geotourism Product' in 2022, 'Challenges and Opportunities in Managing Island Geopark' in 2023, as well as 'Management and Community Involvement in Geopark' in 2024. What sets this regional course apart is its balanced integration of four educational components: lectures, workshops, forums, and field observations. This presentation will focus on analysing the course's effectiveness and key feedback from participants. Given its success, this regional course can serve as a best-practice model for other regions as well.

AROUND THE ORDOVICIAN WORLD IN THREE ROUTES. URBAN FOSSILS IN VILLUERCAS-IBORES-JARA UNESCO GLOBAL GEOPARK, SPAIN

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Keywords: urban fossils, geoconservation, education, geotourism, Armorican Quartzite

Urban fossils have a high educational value, and their easy and almost universal accessibility makes them an ideal tool for introducing people to geology and paleontology. Furthermore, when combined with other types of heritage, especially cultural heritage, they provide a more comprehensive view of the territories.

Pangea Master (Erasmus+; master-pangea.eu) is a unique joint programme specialised in Applied Palaeontology, Palaeobiology, and Geoheritage and its applications to investigate the past as a key to understanding the incoming ecological stakes. Because of this master's degree's collaboration with the UNESCO Villuercas-Ibores-Jara Global Geopark (Spain), three urban fossil routes have been developed in a master's thesis.

The three chosen municipalities are located beneath the peaks of the Armorican Quartzite, a geological formation from the Early-Middle Ordovician period, 470 million years old. Its origin lies in the sands of the seabed near the coast, where trilobites, bivalves, annelids, brachiopods, and other organisms left traces and galleries that have been preserved to this day in the form of *Cruziana*, *Skolithos*, *Daedalus*, and other trace fossils. Traditionally, the rocks that fell from the mountains were used by the local population to build houses, corrals, fences, and so on, becoming small museums where one can learn about that past.

In addition to inventorying the most important sites and specimens and assessing their state of conservation, three routes have been developed, ranging from 10 to 24 points of interest. Thus, while highlighting the urban geological heritage, visitors will tour the villages and learn about their traditional architecture, monuments, interpretation centers, shops selling traditional products, and bars and restaurants that display fossils on their walls.

The routes have been implemented in Google Maps, so no additional app is required. At each stop, information is provided about what to see and some of the fossils from that location are presented. A brochure has also been created explaining the most common ichnofossils and how they arrived from ancient seas to the geopark walls.

These routes will be promoted in the geopark's educational project and in tourism plans, increasing the territory's geotourism offering. Come and learn about our history as you tour our towns!

FROM LAVA FIELDS TO LESSON PLANS: EMPOWERING EDUCATORS THROUGH OUTDOOR LEARNING IN REYKJANES UNESCOGLOBAL GEOPARK

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Keywords: field-based learning, outdoor education, STEAM education, UNESCO Associated Schools Network (ASPnet), teacher training

Reykjanes UNESCO Global Geopark, located on the Mid-Atlantic Ridge in southwest Iceland, is an ideal setting for reimagining how we teach Earth systems, resilience, and sustainability. In response to both natural hazards and educational challenges, GeoCamp Iceland has developed a comprehensive approach to field-based learning that turns a geologically active landscape into an open-air classroom for students and educators alike.

This presentation introduces a regional model for outdoor education that has grown from close cooperation between GeoCamp Iceland, the UNESCO Associated Schools Network (ASPnet), local municipalities, and international partners. Building on an initiative from Reykjane UNESCO Global Geopark all schools in the region have been working to implement UNESCO values in practice, embedding sustainability, cultural awareness, and place-based learning into everyday curricula. Through this initiative, educators are trained to use the geopark's volcanic formations, geothermal systems, and coastal ecosystems as starting points for interdisciplinary learning across science, language, and arts.

Core elements include local engagement events, teacher training initiatives, and the creation of educational resources designed to support active learning in nature. These include both digital and analogue tools that help teachers integrate geoscience, climate education, and sustainability into their classrooms and fieldwork. By fostering collaboration between schools, educators, and the wider community, these activities build capacity for inclusive and innovative teaching practices.

Reykjanes has experienced multiple volcanic eruptions since 2021, and this reality has deepened the urgency for educational approaches that foster both understanding and preparedness. By framing eruptions and tectonic activity as opportunities for learning (rather than disruption alone) students are encouraged to explore real-world questions about climate adaptation, sustainable resource use, and community resilience. This approach not only supports scientific literacy, but strengthens emotional and civic engagement in the face of environmental change.

The abstract will explore how local educational responses are amplified through cross-border collaboration, drawing on lessons from fieldwork, student inquiry projects, and educator exchanges. It also invites participants to reflect on how UNESCO Global Geoparks can serve as educational laboratories, linking earth heritage with the future skills and mindsets needed for a more sustainable world.

By connecting lava fields to lesson plans, Reykjanes offers a grounded yet forward-thinking example of how education in geoparks can move beyond interpretation and into transformation.

THE IMPACT OF AUGMENTED AND VIRTUAL REALITY IN EDUCATION, DATA INTERPRETATION, AND GEOSCIENCES

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Keywords: Virtual Reality, Augmented Reality, decision-making, education

Augmented Reality (AR) and Virtual Reality (VR) are revolutionizing our interaction with information, especially in the geospatial field. These technologies merge the physical and digital world through devices like smart glasses and advanced displays, transforming the way we learn, interpret data, and communicate it. AR and VR enhance the intrinsic motivation of tourists and students, fostering autonomy according to digital competencies. These tools allow for superimposing graphics, interactive maps, or live data onto physical objects or the environment. This is crucial for visualizing complex trends and relationships that are difficult to describe with 2D formats.

Classrooms become dynamic environments where models interact with AR, promoting learning as well as providing sufficient tools for decision-making regarding complex problems. However, to achieve this, co-creation and new teacher training strategies must be promoted. We can visualize superimposed interactive 3D models or participate in real-time simulations that illustrate complex principles, making learning or decision-making more accessible and memorable. For example, AR could superimpose data on the impacts of lahars or volcanic eruptions on a population.

In geological sciences, AR and VR allow for visualizing complex 3D models of terrains and structures, overcoming the limitations of traditional representations. Devices such as HoloLens 2, Apple Vision PRO, Oculus Meta Quest, and platforms like ADA Platform facilitate immersive and collaborative experiences in geological engineering. Sensors like the Laser Survey Device, integrated with AR, enable precise data collection for 3D models in the field. Embodied cognition in the interaction with objects in AR and the need for a clearer vision on multimodality are recent study topics, broadening the theoretical and practical scope of these technologies.

Finally, in communication, VR and AR open new avenues for interaction in geotourism, as we can see, if we wish, the Sistine Chapel in the Vatican with VR. In addition, there are researches that become interactive, allowing users to "manipulate" virtual objects or explore simulated environments, safely. This not only improves the experience but also fosters an engaging and collaborative environment for the exchange of ideas and decision-making.

THE INTEGRATION OF GEOPARK CLASSES INTO THE HIGH SCHOOL CURRICULUM AND THE RESULTING INTERACTION WITH LOCAL RESIDENTS

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Keywords: local education, intergenerational exchange, giving back to the community

The main pillar of geopark activities is giving back to the local community. There are direct and indirect ways, and this report focuses on the latter.

Muroto UGGp has only one public high school with only a little over 100 students. Japan is one of the countries in the world where the population is aging and the birthrate is declining at the fastest rate, but this is even more noticeable in the rural area where the geopark is located. All grades in the high school (Japanese high schools are three-year systems) are taught classes using geopark activities as teaching materials, and promotion council staff (geoscientist and coordinator for international exchanges) also participate in the instruction, contributing to promoting local understanding. These "geopark classes" have two positive effects.

First, these classes are not one-sided teaching from teachers, but are in a format where students themselves think about solutions to local issues through the classes, which is very effective as training to improve thinking skills. It is not enough to simply memorize knowledge; students must reach a stage of "understanding" so that they can explain it themselves. And since the subject is geopark, the subject of understanding is inevitably the area where they live (=Muroto UGGp).

Secondly, school education has been the foundation for initiatives to revitalize the local area and for exchanges between students and the general public. In particular, in first-year classes, geopark guides also served as lecturers, teaching classes on guide techniques and devising new guide courses together with students. Furthermore, students who gained more interest in geoparks through classes participated in guide group events and guided tourists who visited Muroto UGGp as “high school student guides”. It also leads to activities to disseminate information to people from outside the Geopark.

Education itself does not generate direct economic benefits. On the other hand, this case shows that geopark activities contribute to intergenerational exchange and regional revitalization as a tool for getting teenagers involved in local activities, not only in Muroto UGGp but also in Japan, where the population is aging and the birthrate is declining. In this way, incorporating geopark activities into the education curriculum can be said to function as one of the tools to increase interest among local residents.

WHEN NATURE INTERPRETING BECOMES AN EMPOWERMENT TOOL

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Keywords: education, teaching, empowering, awareness, engagement

The area of Geopark Odsherred is fairly limited and extremely rural. The population is quite limited as well; approx. 33,000 inhabitants. This provides a group of children and young people numbering around 3,000, based on 15 schools, which is a high number of schools for such a limited group of students. Therefore, the task of conducting nature interpreting were quite demanding, and called for alternative solutions.

Geographical and financial constraints limit the schools ability to leave for other parts of the geopark and therefore, the solution came naturally; the geopark had to come to the schools. But this again, called for finances, that the geopark didn't have.

Luckily, the local municipality decided to fund (€130,000) the geopark for conducting the teaching, which allow for the employment of two nature interpreters, providing around 200 classes a year, and for something as simple, as a vehicle for the job.

And thus the geopark's formal educational programme ended up being a mobile offer, giving way for teaching in the field. This in itself turned out to be quite demanding for the teachers, not being accustomed to teach in the outdoors. But over the last seven years, we have now seen a shift and most teachers are now asking other products from us, rather than us conducting the actual teaching.

Therefore, Geopark Odsherred, alongside the teaching, now conduct courses for teachers and pedagogs alike, empowering them to conduct their own teaching, based on their newly acquired knowledge on the area and the geopark, to name a few.

So now, we experience a higher level of awareness of the geopark and its values, which not only allows the students and teachers to engage in events and activities, but also for them to bring their own stories into play in a new framework.

This talk will provide more background info and share the experiences of building a service like this, by shedding light on the mechanism behind this programme and provide numbers and statistics on the actual outcome of the programme.

BUILDING CAPACITY FOR STAKEHOLDERS ENGAGEMENT IN THE AZORES UNESCO GLOBAL GEOPARK

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Keywords: capacity building, communication, geoconservation, geoeducation, sustainable development

Aligned with the three pillars of the UNESCO Global Geoparks (Geoeducation, Geoconservation, and Sustainable Development), capacity building is used as a strategic tool to achieve the mission of the Azores UNESCO Global Geopark (UGGp), across the nine islands of the archipelago. The Geopark has delivered comprehensive training to all stakeholders directly or indirectly involved in its activities (staff, educators, nature rangers, partners, tourism professionals, etc.), enhancing their capacity to promote and safeguard the geological heritage of the territory.

A wide range of capacity-building initiatives has been implemented in the last years, demonstrating their relevance, impact, and need for continuation. These include regional, national, and international teacher training programmes – such as *Urban Geology of Terceira Island* and *Introduction to Geodiversity as a Pedagogical Tool* – as well as training under the Erasmus+ EMME project for teachers and students. An annual lecture titled *Geodiversity: Natural and Cultural Identity* is also delivered by the Geopark as part of the Nature and Heritage Guides course at the University of the Azores. Additionally, the Geopark provides annual training for environmental education staff across the archipelago, focusing on content and pedagogical strategies. This year, the Azores UGGp is also co-organizing the Regional Environmental Education Meeting (EREA), a biennial initiative of the Regional Secretariat for the Environment and Climate Action, which will also host the National Pedagogical and Environmental Education Conference, and will be centered for the first time on geodiversity and geological heritage under the theme *Memory of the Earth – a Lighthouse for Environmental Education*.

Technical training and support are provided to nature rangers for geosite monitoring and to island representatives to update geodiversity knowledge and coordinate local actions. Tourism professionals benefit from initiatives like the *Geodiversity and Geotourism* workshop and the *Geotourism by Geoparks* executive course (a joint initiative of the Portuguese Network of UGGp and Turismo de Portugal). Tailored support and ad hoc training are also offered to partners, designed to respond directly to their specific needs.

Together, these initiatives reinforce the Azores Geopark's commitment to inclusive education, effective communication, and long-term conservation of its unique geological heritage.

NETWORKING AND SITUATED EDUCATION: EXPERIENCES FROM THE CIRCULATION OF A MODEL IN THE KÜTRALKURA GEOPARK

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Keywords: education, participatory methodologies, collaboration, local networks

The UNESCO Global Geopark Kütralkura is a unique territory for building educational experiences that link academic knowledge with the knowledge and memories of local communities. Within this framework, an interactive model of the geopark was developed as a pedagogical and participatory tool aimed at promoting dialogue between the university and the inhabitants of the seven municipalities that make up the geopark around the perception and memory of the territory.

The initiative arose from a collaborative effort between the Faculty of Architecture, Arts, and Design at the Universidad Católica de Temuco and the geopark's library network. This unprecedented networking effort was formalized through a multi-actor roundtable, revealing the need to strengthen the connection between the university, communities, and the network of public libraries in the region. The model was conceived as a mobile meeting device capable of traveling throughout the territory and activating conversations between residents, educational communities, and technical teams.

During its circulation, participatory meetings were organized in each community, in which, through participatory methodologies, the voices and memories of the inhabitants were collected regarding how they live, perceive, and project their territories. The model facilitated a collective recognition exercise that made stories, practices, and perceptions visible, consolidating libraries as key spaces for social and cultural encounters. In addition, as part of the comprehensive nature of the project, posters and postcards were designed by fourth-year design students from the faculty, extending the communicative reach of the experience and strengthening the link between higher education and the territory.

From a methodological point of view, the model functioned as a transdisciplinary teaching tool, integrating different layers of information through an audiovisual projection. To promote horizontal participation, priority was given to an approach focused on the bidirectionality of knowledge and the recognition of residents as co-authors of the reflection on the territory. In terms of results, the experience contributed to (i) consolidating an innovative education and communication strategy for the geopark, (ii) strengthening networking through collaborative practices, and (iii) promoting local development based on the dialogue of knowledge.

This initiative shows that education in geoparks can go beyond the paradigm of merely disseminating geological content to become a cultural, relational, and participatory process, where tools such as models act as mediators for imagining shared futures.

PEOPLE WITH DISABILITIES - AN INTERESTING TARGET GROUP FOR GEOTOURISM AND GEO-EDUCATION? EXPERIENCES FROM THE UNESCO GLOBAL GEOPARK SWABIAN ALB

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Keywords: geotourism, geo-education, people with disabilities

People with physical or mental disabilities usually have no or only very limited access to geotourism offers. This not only excludes a large number of people from geo-education and geotourism, but also means that a considerable tourism potential is neglected. As early as 2025, an estimated 160 million people will demand accessibility. Demographic change will lead to a further increase. 70% of these people will have both the financial and physical ability to travel, which can lead to potential revenues of almost 90 billion euros.

The concept of “accesible geotourism” or “geotourism for all” attempts to make geotourism experiences possible for people with different disabilities through appropriate design (accessibility; tactile objects; simpler language) and information on this, e.g. on the geopark homepages. In the case of in-door offers, this can be achieved through barrier-free access and the use of digital technologies that can provide insights into locations that are otherwise inaccessible to people with disabilities.

Accessibility is easier to implement in visitor centers, museums and other indoor facilities than in the field. Nevertheless, boardwalks or special guided tours, for example, can also provide access here. Alternatively, digital offerings provide insights into locations that are otherwise inaccessible to people with disabilities. For example, the digital geotrail on the Etna volcano allows people who are unable to do this independently in the field to “walk around”. For people with visual impairments, boards with Braille or audio tours are available, and for the hearing impaired, guided tours in sign language or self-guided tours with brochures, boards, etc. Experts for deafblind people and geoscientists jointly developed for Spanish UGGp special geotours for deaf-blind people with a high proportion of touch and feel. Guided tours and texts in easy language enable people with intellectual-cognitive impairments to participate.

As part of the INTERREG project Danube Geotour Plus, in which nine geoparks from the Danube region are involved, the UNESCO Global Geopark Swabian Alb is developing in close cooperation with regional institutions for the disabled, special target group-oriented geotourism and geo-education offers for people with disabilities. The concept envisages an app-based digital scavenger hunt across the entire area of the Swabian Alb, which builds on existing infrastructure and integrates less frequented geo-highlights in an interactive way (story telling). At the same time, this will steer visitors to relieve previously over-frequented areas and integrate less frequented areas. There will be a remote alternative for people with significant mobility restrictions and for preparatory school lessons.

The presentation will introduce the project and discuss the potential of the target group “people with disabilities” in general, as well as the specific challenges and risks.

APPLICATION OF UNIVERSITY EXTENSION TO PROMOTE COMMUNITY ENGAGEMENT AND SCIENTIFIC DISSEMINATION OF THE CAIUÁ GEOPARK PROJECT

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Keywords: Caiuá Geopark Project, paleontological heritage, youth engagement

The extension project "Geoeducation in Action: Contribution to the Caiuá Geopark Project", part of the broader program "Geography Without Borders: Nature, Society, and Technologies", aims to engage and raise awareness among the population about the value of geological heritage through geoeducation, supporting the implementation of the Caiuá Geopark initiative. Developed by the Department of Geography at the State University of Maringá (Paraná, Brazil), the project began in 2024 with introductory sessions focused on the "6 Gs of Geodiversity": Geodiversity, Geoheritage, Geotourism, Geopark, Geoeducation, and Geoethics. These sessions prepared participants to apply geoscientific interpretation and develop effective didactic strategies for communicating complex geoscience concepts. The first activity, a Geological Timeline Workshop, was conducted in a school in Sarandi-PR, involving children aged from 4 to 14 in interactive workstations: simulating volcanoes and painting early Earth for the Precambrian; modeling trilobites for the Paleozoic; excavating and painting dinosaur replicas for the Mesozoic; and assembling landscape dioramas for the Pleistocene. The activity concluded with the creation of a proportional string timeline, illustrating life's diversification and humanity's brief existence, fostering discussions on evolution and extinction. In partnership with the Geological Survey of Brazil (SGB) through the SGBeduca program, a fossil replica workshop was held at UEM, training students and monitors in science communication techniques focused on geodiversity for young audiences. A follow-up painting workshop took place at the Cruzeiro do Oeste Paleontological Museum, where children from multiple cities painted their own fossil replicas and participated in a guided museum tour. Covered by local media, the activity highlighted the importance of geoscience outreach in Paraná. These interactive actions demonstrate geoeducation's effectiveness as a tool for awareness and geological heritage appreciation—essential for the development and recognition of geoparks. The project will continue in 2025 with new workshops at the Cruzeiro do Oeste Museum and the Ingá Park in Maringá.

FEN VOLCANIC COMPLEX – GEOPARK DEFINING HERITAGE AND POSSIBLE FUTURE MINING IN GEA NORVEGICA UGGP, NORWAY. COMMUNICATION AND CHALLENGES

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Keywords: communication, education, REE, defining heritage

One of the defining heritages of Gea Norvegica UGGp is found in Ulefoss municipality. The Fen volcanic complex is the world type locality for carbonatite volcanism, for the metasomatic process fenitization and for rocks as soevite, damtjernite and fenite. The volcano was active around 580 million years ago and the volcano itself is eroded and not anymore, a visible structure in the landscape. The existing remnants are the rocks formed beneath the volcano and rocks that crystallized in the feeding systems. These rocks were the ones that W.C. Brögger (1851-1940) noted and understood that these rocks were connected to an unfamiliar volcanism. He described several new rock types, named after local farms, in his publication from 1921. His discovery and theory became highly debated at the time – and the existence of carbonatite volcanoes was not proved until 1960ties when the Tanzanian volcano erupted and soevite (Søvite in Norwegian, after the farm Søve) was formed. The Fen volcano has made the way for resources for different kinds of mining through history, since medieval times. And now – the big issue is Rare Earth Elements (REEs). The Fen area is evaluated as the biggest occurrence for REE in Europe and hence the Norwegian Government is eager to be part of the natural resource security chain.

The research is ongoing, but the prospect of future mining is not ready but there are discussions and some suggestions on the future processes. A lot of people and of course organizations are involved.

Gea Norvegica Geopark is following the process closely and are in included in parts of the processes, since the main stakeholder; Nome municipality, is also part of the geopark structure, as owner in the inter-municipal company. Our main task is to inform the local population and visitors, both through participation in the processes, through communication and education and we work towards sustainable activities like Geotourism in the area. Fen and Nome municipality has many qualities, the Geoparks has as task to promote the area from much more than the possible new mining and we use the historic mining, the agriculture, the history of the "strange volcano", the scientific history, and the general nature and cultural history in our communication. At the same time, we work together with the local population in order to protect and preserve our defining geological sites in the area.

The presentation will give a short overview of the Fen volcanic complex and how we carry our communication and education connected to this strange geological phenomenon.

COMMUNICATE KÜTRALKURA: COMMUNICATION, DISSEMINATION, AND OUTREACH STRATEGY FOR THE FIRST CHILEAN GEOPARK

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Keywords: communication, dissemination, voices of the local community

The UNESCO Global Geoparks are living, active landscapes where science and local communities work together for mutual benefit.

In this context, visibility is one of the relative variables to work on in Geoparks so that—along with management, networking and identification of international geological heritage—development of an active, strategic plan in which local communities are involved can be achieved, based on the education, conservation and geotourism pillars for a sustainable and inclusive development.

The communication challenge is permanent and requires the generation of innovative strategies, the utilization of different means and the creation of attractive content that enhances the scientific divulgación dimension and citizen science.

The Regional Government of La Araucanía—taking into consideration one of the seven evaluation criterions for the Geoparks:visibilization—develops a communication, dissemination and citizen outreach strategy that comprises an intersectoral team and mobilizes technical and institutional competencies to contribute to a greater positioning of Kütralkura, the only Chilean Geopark, with in the framework of the 11th Conference on UNESCO Global Geoparks.

The seven municipalities that confirm the geopolitical territory of the Kütralkura Geopark—through its tourism, communications, productive development and culture teams—move forward with a common narrative, eliminating comunal frontiers highlighting the ancestral knowledge of the Mapuche cosmovision: the respect for ñuke mapu (mother earth), the care for itrofill monguen (all life with no exceptions or biodiversity) and the preservation of both humans and sustenance for future generations.

This narrative is told in a choral way by authorities and habitats of the territory through the use of digital and press media, which highlights communication from a territorial and citizen approach.

The Communication Strategy (abbreviated in Spanish as E.C) contemplated the creation of multiformat content—testimonues, audiovisual spots, visual material and digital narratives—, highlighting the viral narrative of Melián Cepeda, a boy of the Corretúe sector of Curacautín who explains with closeness, relevance and the sweetness of childhood the importance of geoparks and their people.

In parallel, management of the press with regional and national media considered the experience of a Fampress trip, where communications professionals learned firsthand about the scientific and cultural value of the territory, in order to project Kütralkura as a world reference in

geoconservation, community participation and sustainable development.

Communicating Kütralkura is not only disseminating a territory, it's weaving the living memory of the earth with the voices of those who live in it. Each word told by its communities, volcanoes and lakes is transformed into an act of territorial defense and belonging.

The communication that unfolds here is not a tool, but an echo of ñuke mapu and the wisdom of the communities that safeguard her. Kütralkura reminds us of the urgency of communicating with relevance, with respect for ancestral knowledge, and with a deep commitment to future generations.

Kütralkura's Communication Strategy is no longer a medium and has transformed into a bridge. It becomes a meeting place where science, culture, and the community engage in dialogue to envision a future where every word is a seed planted to defend and protect the territory.

STRATEGIC PUBLIC COMMUNICATION IN MANAGING MINING CONTROVERSIES WITHIN THE RAJA AMPAT UNESCO GLOBAL GEOPARK

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Keywords: communication, geopark, Raja Ampat, nickel, conservation

The revocation of nickel mining permits in Raja Ampat has sparked widespread debate across social media and national news outlets, particularly concerning its status as a UNESCO Global Geopark and a priority marine conservation area. In this context, the Geopark Management Body faces the challenge of maintaining institutional neutrality while ensuring public information clarity. This study documents the public communication strategies employed in addressing the #SaveRajaAmpat issue, emphasizing a non-confrontational, educational, and data-driven approach. Through narrative monitoring, positive framing analysis, stakeholder education, and neutral digital content development, the strategy demonstrates effectiveness in de-escalating tensions and reinforcing the geopark's role as a space for sustainable development. The central argument of this study is that reactive and confrontational confirmations, especially when delivered sporadically, risk exacerbating public resistance and misperception. Instead, dialogic and collaborative approaches are more aligned with geopark principles, empowering local communities and regional governments in navigating global pressure on natural resources.

COMMUNICATION & POPULARISATION OF GEO-THEMES IN GLOBAL GEOPARKS & GEOLOGICAL WORLD HERITAGE SITES: CHALLENGE AUDIENCES, CHILDREN & MEDIA TOOLS

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Keywords: communication, popularization, education, geotourism, global geoparks, world heritage

Over the past 20 years, communicating topics from the Global Geoparks and geological World Heritage Sites has proven to be a challenging task. The geoscientific content of the geoparks is based on their extra-ordinary landscapes and the history of their formation. These lead to a variety of geoscientific phenomena. The results of investigations of phenomena by various natural and geoscientific disciplines open the treasure chest of the earth and reveal its significance for mankind, its cultural development and for life today and in the future.

Global Geoparks and geological World Heritage Sites contribute to the achievement of UNESCO's objectives by promoting geology and science in general through a broader contribution to UNESCO's mandate. They cover the areas of education, culture and communication to a wide audience of ages: 1-100 years.

The communication of science and geosciences has traditionally focused on the ex-change of research results between colleagues and on scientific platforms. Informing the public, which ultimately funds many research projects, often takes second place. Beside that, “geology” or geo-topics are no longer present in many school curricula. As a result, many people know only little or nothing about the earth, the planet they live on and the natural processes on earth or evidence of its change, even though they are con fronted with climate change etc. via the media. This is particularly true for one audience: children aged 1-6, those before they start school and also up to the age of 10. There are countless publications on certain geo-topics, e.g. many on dinosaurs. But what about the basics? How do children of pre-school age and in their first years of school learn about their earth to get to know it?

Geoscientific phenomena in Global Geoparks have been the focus of geoscientists for over 20 years and are explained by them. Global Geoparks and World Heritage Sites have developed examples for communicating topics to the public and especially to children. Modern technologies have led to the development of new forms of communi-cation and disciplines. An exchange between these disciplines, the geosciences, global geoparks or world heritage sites is not only desirable but essential having technologically highly equipped children.

Communication objectives for the general public of Global Geoparks and World Heritage Sites are not easy to define, nor is the evaluation and analysis of measures. New technologies are increasingly being used to raise awareness of UNESCO-certified sites and attract more visitors. Is promoting leading to understanding?

Do analog or digital media for children exist on basics to know and understand Planet Earth, its landscapes, rocks and functioning etc.? This article sheds light on the situation, picks up visual communication as a new option and presents an approach of making the planet‘ basics accessible to young “Earthlings“.

GEOLOGY FOR THE ELDERLY: THE EXAMPLE OF THE OESTE UNESCO GLOBAL GEOPARK (PORTUGAL)

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Keywords: education, interpretation and communication

The Oeste UNESCO Global Geopark (Oeste UGGp) comprises the municipalities of Bombarral, Cadaval, Caldas da Rainha, Peniche, Lourinhã and Torres Vedras. Located in the Portuguese central west region (Europe), it has a total area of 1154 km² and 72 km of Atlantic coastline. Rocks from the Jurassic Period are the most common in the territory, representing 77% of the total area, and are known for its many dinosaur discoveries.

The dissemination of the geological heritage is one of the main goals of UNESCO Global Geoparks. Since 2020, Oeste UGGp has invested in creating an increasingly complete and accessible Educational Programs Catalog, with activities for all ages. This work has led to a significant incease in demand from the public.
Senior groups have increasingly sought out Oeste UGGp's activities. This growing demand has made it possible to disseminate the concept of UNESCO Global Geoparks, the geology of Oeste UGGp territory, as well as biodiversity and cultural heritage among these age groups.

In the 2024/2025 school year, Oeste UGGp carried out several activities with senior groups: games on the Sustainable Development Goals (SDGs), guided visits to CIGO - Oeste Geopark Interpretation Center, and field visits around the Geopark territory, fully personalized and accessible to elderly people.

More than 200 people participated in these activities, affirming the role of the Oeste UGGp as a vehicle for disseminating scientific knowledge among all age groups.

This specific audience requires the use of communication and preparation methodologies that are different from those of other audiences, but which are very similar to those of young people. Therefore, when organizing the different types of tours aimed at seniors, we always adopt the following methodology: 1. Provide accessible and inclusive routes; 2. Have breaks every 60 minutes, with access to water, a bathroom, and a place to sit; 3. Always consider seating areas during the tour; 4. Have more than one instructor present; 5. Visit a few locations in a single day; 6. When having a meal, create a time buffer for unforeseen events.

We believe that organizing programs specifically for seniors is also one of the many functions of a UNESCO Global Geopark. However, in addition to promoting and communicating the natural heritage, we can include a participatory methodology, where visitors also contribute their stories and emotional experiences throughout their visit, not only with traditions and customs, but also with the places they visit.
This is a commitment of the Oeste UGGp, and it has seen increasing demand from this type of target audience

FLORA: A CITIZEN SCIENCE PROJECT TO MONITOR PLANT BIODIVERSITY IN THE ALGARVENSIS GEOPARK

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Keywords: citizen science, sustainability, geoeducation, biodiversity, environmental awareness

The FLORA project is a citizen science initiative aimed at engaging school communities with the natural environment of the Algarvensis Geopark. Targeting mainly urban students, the project promotes identifying and monitoring plant species - both native and invasive - across the park's varied landscapes. FLORA raises awareness of biodiversity and conservation while encouraging active participation in scientific observation and data collection. In collaboration with the Biodiversity4All/iNaturalist platform, students are guided to map plant diversity within the 2,428 km² of the park (including 843 km² of marine area) spanning the municipalities of Loulé, Silves, and Albufeira. The initiative combines classroom theory with fieldwork at geologically and ecologically significant sites. The data collected are shared on the platform and validated by the wider community of naturalists, ensuring scientific accuracy and open access. Originally piloted in a single natural area, the project now includes fieldwork at key geological sites such as the Escarpão Plateau and Arrifes, the latter being an internationally recognised geological site. After four years, the FLORA project has contributed over 85,000 biodiversity records, providing a valuable dataset for conservation and land management decisions. By integrating into the national curriculum for upper-secondary education (10th and 11th grades), FLORA not only supports science education but also fosters environmental values and a sense of stewardship among young people. The project exemplifies how geoeducation can connect communities to their territory and natural heritage through participatory and inclusive science. Building on its success, FLORA is now entering a new phase of expansion across the entire Algarvensis Geopark. With its integration into the broader educational and scientific strategies of the Geopark, FLORA is becoming a foundational initiative that enhances environmental literacy and encourages community involvement within Loulé, Silves, and Albufeira. Future plans include strengthening territorial coordination, improving data-driven approaches, and increasing participation from schools and local partners, ensuring this citizen science project continues to reflect and serve the collective vision and identity of the Algarvensis Geopark.

GEOPARK INTERPRETERS AND GEO-PARTNERS AS GREEN EDUCATORS AND COMMUNITY CONNECTORS OF HANTANGANG UNESCO GLOBAL GEOPARK

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Keywords: Hantangang Geopark, geo-education, geo-partners and interpreters, eco-friendly promotional materials

The Hantangang UNESCO Global Geopark, located in the central region of the Korean Peninsula, has been fostering environmental awareness and sustainable development through its unique community-based education programs. Geopark interpreters and geo-partners play a pivotal role as green educators and community connectors by delivering engaging geo-education programs, particularly targeting youth and local stakeholders. These programs emphasize geological understanding alongside broader environmental themes such as climate change, biodiversity, and sustainable lifestyles.

A key strategy in these efforts is the use of eco-friendly promotional materials that not only minimize environmental impact but also effectively convey messages of conservation. Reusable items are distributed during educational events and local festivals to deepen public engagement and promote sustainable behaviors.

Youth-focused geo-education is a cornerstone of the Hantangang Geopark's mission. Through school partnerships, field-based learning, and hands-on interpretation activities, students are encouraged to explore the geological and ecological significance of their local environment. By nurturing the next generation of geo-literate citizens and fostering place-based identity, the geopark strengthens its role as a catalyst for community participation and environmental stewardship.

This paper highlights the integrated approach of the Hantangang Geopark in mobilizing interpreters and geo-partners as mediators between science, society, and sustainability. It offers insights into practical tools and strategies for building community resilience through geopark education.

VULCANO PROGRAM: EDUCATION AND HERITAGE IN THE VOLCANES DE CALATRAVA GEOPARK, CIUDAD REAL (CASTILLA LA MANCHA, SPAIN)

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Keywords: education, interpretation and communication

The Volcanes de Calatrava Geopark, located in the province of Ciudad Real (Castilla-La Mancha, Spain), is a truly unique territory due to its rich geological, natural, historical, and cultural heritage.

It tells a long and complex geological story, with rocks and formations that span approximately 600 million years—from the Neoproterozoic era (Precambrian boundary) to just around 6,000 years ago. This extensive record reveals the major geological processes that have shaped the region, highlighting the volcanic activity of the Campo de Calatrava, one of the most distinctive volcanic areas on the Iberian Peninsula.

Geopark includes educational initiatives such as the Vulcano Program, interpretive routes, geosite signage, museums, and interpretation centers.

The Vulcano Program is one of the key pillars of the Volcanes de Calatrava Geopark, Ciudad Real" Its aim is to bring the values of the region's geological, natural, and cultural heritage closer to the educational community, promoting knowledge, appreciation, and protection of this unique environment.

During the 2020–2021 and 2021–2022 school years, several training activities were carried out for teachers through the Regional Teacher Training Center Platform:

2020–2021 School Year:
- Course: "Volcanes de Calatrava Geopark Project and its Teaching Methods. Knowing to Teach"
- Inter-school working group: "I Like Volcanoes"

2021–2022 School Year:
- Course: "Volcanes de Calatrava Geopark Project. Discover It Up Close"
- Inter-school working group: "The Geopark Project Enters the Classroom"

The educational program includes a set of 22 activity sheets for classroom work, complemented by a field notebook designed for school outings. Students who visit and complete information on 10 geosites in the field notebook will receive a diploma certifying them as a "Geopark Volcanologist." And a set of activities and resources developed by teachers from various educational stages, coordinated by the Provincial Delegation of Ciudad Real of the Regional Ministry of Education, Culture and Sports, and in collaboration with members of the Geopark Scientific Committee. These materials are compiled in a "Practice Workbook", aimed at providing teachers in Early Childhood, Primary, and Secondary Education with the necessary tools to address different aspects of the Geopark and to gain a deeper understanding of it.

This program is a key tool to encourage active learning and to strengthen the connection between students and their environment through an innovative educational approach committed to sustainability and the local territory.

RESEARCH ON GEOSCIENCES EDUCATION AND COMMUNICATION IN THE ERA OF NEW MEDIA & TECHNOLOGIES

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Keywords: new media and technologies, Interpretation and Communication, integration of geology and culture, AI

Against the backdrop of the rapid advancement of new media and technologies, the methodologies employed in the popular science education are undergoing profound transformations. This study examines this contemporary context, taking the popular science initiatives for geoheritages along Hainan's Hainan Coastal Scenic Highway and the innovative science communication practices at Taining Global Geopark as case studies to explore the evolving patterns in the development of geological popular science materials. Through an analysis of cases including the establishment of online geological education platforms and the application of AI-powered audio-visual technologies in education, this study illustrates the innovative integration of geoscience and technologies, and animation techniques in the creative process. These new media and technologies not only diversify the presentation formats of popular science education and communication but also enhance both efficiency andeffectiveness—with AI technologies, for instance, addressing challenges in scene reconstruction while reducing production costs. The research demonstrates that new media and technologies enable geological popular science materials to better meet public needs, stimulate public interest in geological sciences, and achieve science education objectives. Special emphasis is placed on the critical role of integrating geological content with cultural elements in strengthening the relevance between science education and human life.

Along the Hainan Coastal Scenic Highway, there are not only abundant geological relics suchas volcanic rock coasts and marine erosion landforms, but also well-preserved marine cultural heritage including ancient salt fields and fishing settlements. Its popular science project connects scattered geological sites with surrounding cultural relics to form a dynamic landscape corridor. When visitors scan the QR code, AI technology reconstructs the principle of volcanic eruptions and demonstrates the formation mechanism of volcanic rock brine pools, enabling the public to intuitively perceive the profound connection that "geological environment shapes production methods" and transforming the geological evolution process fromstatic texts intointeractive temporal-spatial and humanistic narratives.Taining World Geopark has deeply integrated Danxia landforms with local culture and explored a new popular science model of "AI + geological relics + cultural narratives". Based onAI animation, it not only displays the formation process of Danxia landforms but also presents in association the wisdom of ancient people in building temples by utilizing Danxia red cliff caves.

Analysis of these two case reveals that internet thinking has transformed science communication from one-way dissemination to interactive engagement; geological information technologies enable multi-scale representations of both macro landforms and micro minerals; and the integration of geological and cultural elements, combined with multi-modal technologies, has created immersive learning environments. The research confirms that the integrated application of visualization, diagrams, animation, and AI technologies—coupled with deep integration of geology and culture—not only enriches geological science communication formats but also stimulates public curiosity through precise demand matching and cultural relevance, providing technical support and innovative pathways for achieving science education goals.

INVOLVEMENT OF LOCAL COMMUNITY IN THE CONSERVATION, INTERPRETATION, AND PROMOTION OF THE GEOLOGICAL HERITAGE OF THE MOLINA ALTO TAJO GEOPARK

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Keywords: Community Interpretation Promotion Education Conservation

UNESCO Global Geoparks are obligated to work for the conservation and promotion of their heritage, especially geological heritage, by including it in the curriculum of their schools. Furthermore, their work must be driven by their local communities. Below, we describe some examples of how the local community of Molina Alto Tajo UGGp impulse these activities to involve its local community in the Geopark's objectives.

Students from schools in this area go on field trips to explore the Geopark's main heritage sites. The Geopark's Technical Team and school teachers have worked to engage the local community, ensuring that people from the municipalities visited present the heritage to the students. To this end, meetings are held with these people from the towns, who are familiar with their heritage but often unaware of its significance. This results in improved student learning and, at the same time, a stronger appreciation for the local community's heritage.

When designing interpretive posters or brochures, the Geopark team brings together municipal representatives and cultural associations members in each town to decide on the content and design. With the advice of the Scientific Committee members, the result is a quality interpretive item that serves the purpose of strengthening the local people's appreciation for its heritage.

Local community members also take center stage in field trips organized to promote heritage, sharing the role of explaining their heritage with Geopark specialists or the scientific committee. This gives them the opportunity to receive feedback from attendees about their interest in these values, which reinforces their appreciation for their land.

The Geopark team is supporting the municipalities' cultural associations to develop exhibitions about their heritage that can be displayed in other municipalities in the region. This cultural exchange results in the involvement of the local community in exploring their heritage and proudly showcasing it throughout the Geopark.

The above activities are used to discuss how the local community can contribute to the conservation efforts carried out by public authorities through regulations, by providing a close presence at sites of geological interest that are at risk of deterioration.

THE UCT MATERIOTECA: A MATERIAL INVENTORY THAT CARES FOR THE KÜTRALKURA GEOPARK

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Keywords: material thinking, material experience, interdisciplinary education, ecological conservation, social development.

Knowledge of materials is essential for learning a craft, as the craft itself depends intricately on the nature of the material. While various techniques can be mastered, they cannot be arbitrarily applied to any material as they must always be adapted to its specific properties. In relation to the environment, ecosystem, and culture of the Kütralkura Geopark, materials are an active component of the creative process: they have properties that stimulate the senses, and, depending on their nature, the same design method can lead to different results.

In academia, there is an artificial separation between the disciplines that address raw materials. Each branch of specialized literature focuses on its own field, overlooking important interdisciplinary connections that could give materials the attention they deserve, enabling them to be used more sustainably. In the case of wood, for example, we find literature on botany, forestry, and forest management; on its economic impact; its physical and technical properties; and its applications in different trades and fields, but these areas are rarely interconnected.

The Materioteca ("Material library"), an initiative of the School of Creative Crafts at the Universidad Católica de Temuco, seeks to address these problems from the theoretical foundations of the courses offered: experience and material thinking. It consists of a material archive, housed in the university library, where students can see, touch, feel the weight of, and even smell different types of clays, fibers, and woods. It is complemented by technical information concerning interdisciplinary descriptions of these elements. This presentation describes the implementation of the first part of this project, the Maderoteca ("Wood library"), dedicated to the different samples found in the Region, and especially in the Kütralkura Geopark.

The aim of the Creative Trades Materioteca ("Material library") is to broaden the range of students' experiences, offering them a solid foundation for their creative work. At the same time, it is an attempt to preserve traditional knowledge, increase its accessibility, and develop it from a contemporary perspective. In short, it seeks to integrate practice into the learning process, something that is often neglected in academic teaching.

We believe that deepening our understanding of local materials can bring benefits that transcend the academic sphere. For example, there are woods with ideal properties for certain uses, but which are in danger of extinction, or whose extraction leaves a significant ecological footprint. Acknowledging the variety of wood in the Kütralkura Geopark allows us to propose alternatives that avoid negative environmental impacts. Finally, beyond ecological conservation, the conscious use of materials can provide cultural, social, and economic benefits, fostering a sense of belonging, community regeneration, and sustainable development.

HANDBOOK FOR THE INTERPRETATION OF GEOLOGICAL HERITAGE IN KRAS-CARSO CROSSBORDER GEOPARK

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Keywords: education, interpretation, Classical Karst, aspiring UGGp

Over the past five years, two INTERREG Italy-Slovenia projects – GeoKarst and Kras-Carso II – have aimed to help the Kras-Carso Slovenian-Italian cross-border geopark fulfil all the requirements for applying to join the UGGp Network. Several educational products were developed by geological institutions, including the Handbook for the Interpretation of Geological Heritage in the Kras-Carso Geopark, published in 2025 and, in two parts, also available on the aspiring geopark's website:
https://www.karst-geopark.eu/portale/documenti/118_TheClassicalKarstGeopark-Italianparthandbookforgeologicalguides.pdf
https://www.karst-geopark.eu/portale/documenti/117_Handbookfortheinterpretationofgeologicalheritage Slovenianpart.pdf
This handbook is intended for anyone faced with the difficult task of presenting the geology of the Classical Karst to lay visitors. Although it is primarily aimed at tourist and nature guides, museum curators and schoolteachers in the geopark area, it may also be useful for managers of tourist attractions and quarries, as well as anyone living near a geological attraction in the Karst.

We decided to make this handbook two-sided, with the longer section acting as a geological textbook presenting the fundamentals of geological, hydrogeological and geomorphological (karstological) concepts, features and processes from the ground up. On the other side, we aimed to present challenging geological material to those without in-depth knowledge of the subject. To achieve this, we have written the content in a concise and user-friendly style so that it can be used to present the most important and interesting geological information on a guided tour of the geopark.

The content is organised in a way that the main chapters contain colour-coded boxes with three functions: explaining key concepts; highlighting interesting facts and current topics related to the region's geology; and emphasising the importance of protecting nature. A nature that is unique for the grandeur of its superficial and underground karst forms. The one content which we believe is very useful, is the visual aid. It was created based on our experiences with the most frequently asked questions posed by curious visitors on geology tours, particularly in relation to specific geological features.

Our geopark's guides face a significant challenge. Most rocks in Karst that are found next to the road do not look very interesting. Their amazing richness can only be seen at a microscopic level. Furthermore, the karst process is not easy to understand. Therefore, we have organised several courses, where guides were able to learn the scientific aspects of the geology of the Classical Karst from university professors and researchers, also going into detail about the analysis of (micro)fossils in rocks. To make the geological experience more exciting, we strongly recommend the use of basic pieces of geological field equipment and have provided instructions on how to use it.

SCIENCE TOLD BY CHILDREN: THE ROLE OF JUNIOR GUIDES IN PALEONTOLOGICAL MEDIATION IN THE ARARIPE UGGP

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Keywords: Araripe Geopark, Educational Program, paleontology

For 37 years, the Plácido Cidade Nuvens Paleontology Museum, located in Santana do Cariri in southern Ceará, has played a key role in scientific and cultural mediation for its visitors. The municipality is part of the Araripe UGGp territory and houses one of the world's most important collections from the Cretaceous period. Within this context, the work of young students from the local public school system stands out, as they serve as junior guides and act as key players in scientific outreach and the promotion of regional paleontological heritage. The junior guide training project is linked to youth extension programs at the Regional University of Cariri (URCA). After selection, participants undergo interdisciplinary training, including courses in paleontology, geology, biology, English, and Brazilian Sign Language (Libras), as well as guidance techniques and personal development training offered by regional tourism professionals. Throughout the program, the students engage in activities aimed at preserving the natural and scientific heritage of the Cariri region. Their actions include guided tours for visitors, participation in educational events, scientific communication practices, and experiences that strengthen regional identity. According to internal data from the Paleontology Museum, it is estimated that around 85% of former junior guides go on to attend public universities, with the majority choosing courses related to Paleontology or similar fields. Others pursue careers in entrepreneurship and the creative economy, launching small businesses with themes inspired by Paleontology. Thus, the junior guide project stands out as a highly impactful educational and social initiative, promoting not only scientific outreach but also sustainable development within the Araripe UGGp territory. This experience reinforces the museum's role as a transformative agent, integrating childhood, science, culture, and community belonging.

DIGITAL COMMUNICATION AND EDUCATION FOR SUSTAINABLE DEVELOPMENT: COMARCA MINERA GEOPARK

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Keywords: Facebook, social media, education

The UNESCO Global Geopark Comarca Minera in Hidalgo, Mexico, has strengthened its digital communication strategy through active use of social media, its official website, and the development of educational and multimedia content. These resources promote awareness of geological, natural, and cultural heritage while also encouraging citizen participation, ongoing education, and community involvement. These actions are aligned with the Sustainable Development Goals: Quality Education and Partnerships for the Goals.

Facebook is used to share informational clips, interviews, live broadcasts, and tours around geosites. From January to July 2025, the page recorded 324,596 views and reached 66,130 people, which demonstrates strong engagement from the community and digital visitors. This interaction has promoted social appropriation of the territory through accessible communication.

The official website https://geoparquecomarcaminerahidalgo.com features information organized into sections such as "What is a Geopark?", "Geosites," "News," "Educational Material," and "Activities." Between January and July, it received 12,100 visitors and a total of 37,900 visits, establishing itself as a key reference platform for students, researchers, and the general public. As part of its educational commitment, the Geopark has brought the Earth Sciences Workshop to several schools in the region, fostering interest in geology, the environment, and heritage from an early age. These visits help bring the principles of UNESCO Geoparks to schools and strengthen the connection with local communities.

Additionally, 16 conferences have been live-streamed on Facebook, reaching an approximate total of 384,000 views. Some of the covered topics are:

- "Conservation in the Barranca de Metztitlán Biosphere Reserve."
- "The Comarca Minera Geopark: Historiography of Its Pre-Hispanic Past."
- "The Birds of the Geopark: Biological Heritage and conservation challenges."
- "Environmental Services Provided by Bats in Hidalgo."

This content is available on the Geopark's YouTube channel, enhancing its educational impact in a free and permanent way.

In terms of inclusion and gender equality, the Geopark promotes lectures with a gender perspective and courses, such as Mexican Sign Language, which encourage representative and accessible spaces.

The Children's Geopark project has also been consolidated with its platform https://geoparquecomarcaminerainfantil.com, which offers free Lúa books aimed at children and promotes learning about science and heritage playfully and equitably.

Collectively, these actions consolidate the Comarca Minera Geopark as a benchmark in the region for environmental education, community participation, and inclusion, reaffirming its commitment to UNESCO's principles.

SUSTAINABLE DEVELOPMENT AND EDUCATION OF XINGYI GLOBAL GEOPARK

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Keywords: Xingyi UNESCO Global Geopark, Karst landscapes, Xingyi Fauna, Science popularization and education

The Xingyi UNESCO Global Geopark is situated in Guizhou Province, Southwest China, covering an area of 1,456.1 square kilometers. It is home to 100.45 million people residents from 26 ethnic groups, with the Han, Buyi, and Miao being the predominant ones. Known as the "Karst Kingdom," the geopark boasts a wealth of distinctive landscapes, including Wanfenglin, Maling River Gorge, and Wanfeng Lake. It also earns the title of "Paleontological Kingdom" as the discovery site of Keichousaurus—Asia's first fossil of a marine reptile. The Xingyi Fauna here is remarkably diverse, encompassing fossils from various groups such as marine reptiles, fish, bivalves, and ammonites. Furthermore, it stands as a "Sedimentary Rock Kingdom," ranking among the regions with the most complete and well-preserved Triassic sedimentary formations. Yuhuangding serves as a classic example of ancient collapse relics in the Triassic facies transition zone. In terms of conservation, the geopark has issued a judicial protection order for the paleontological fossils of the "Xingyi Fauna." Its highly heterogeneous ecosystem supports 1,845 species of higher plants (nearly one-fifth of Guizhou Province's total plant species) and 438 species of vertebrates (nearly 30% of Guizhou Province's total vertebrate species), including numerous rare and protected species. For science popularization and education, the Xingyi UNESCO Global Geopark places great emphasis on community education. A standout example is the Xingyi UNESCO Global Geopark Primary School in the Wanfenglin area. As a typical rural school, it enrolls over 300 students, all children of local residents. These students learn professional geological knowledge and ethnic cultural heritage within the geopark, poised to become excellent inheritors of this legacy. In terms of international cooperation and exchanges, the geopark promotes itself through its official website. It has established sister park partnerships with other geoparks worldwide and integrated into the global geopark network, showcasing its unique charm to the international community.

"LOCAL STORIES OF OUR VOLCANOES": A NETWORKING INITIATIVE AMONG EUROPEAN UGGP LINKING GEODIVERSITY & CULTURAL HERITAGE

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Keywords: geodiversity, cultural heritage, communication, networking

The book "Local Stories of Our Volcanoes" now presented is an innovative networking activity among the members of the EGN Working Group "Volcanic Areas". Promoted and coordinated by El Hierro Geopark, the book aims to highlight the geodiversity of the European UNESCO Global Geoparks and their connection with the cultural heritage of the territories, through legends, stories and/or myths long ago known and preserved by their people.

Fourteen UNESCO Global Geoparks in Europe from nine nations (Czech Republic, Germany, Greece, Hungary, Iceland, Portugal, Spain, Turkey and Slovakia) participate in this publication. The main innovative approach of this book is the inclusion of ten different languages in a single publication, including the native language of each of the nine countries involved, as well as English.

The structure of the book "Local Stories of Our Volcanoes" includes, for each geopark, a tale story text, an illustration, a brief geological description of the site/landscape/feature/phenomena addressed in the local tale story and a photo that exemplifies it. All texts are in English and the corresponding geopark's native language. Worth mentioning are the illustration specially conceived and created for this book by Adriana Sandec (Canary Island), who interpreted each legend and story in a graphic and deeply personal way. Being the main target group youth (e.g. 15-20 years old), special care was taken with the content, namely avoiding overly scientific descriptions or approaches when explaining each geopark's geological site/feature/phenomenon.

Paraphrasing the author of the book's preface, Maria Luise Frey, "Get ready for a journey into the fiery Earth, through craters, maars, lakes, bogs, rivers, tropical rainforests and laurel and beech petrified forests, valleys, cliffs, landscape like giant organs, atolls with reefs and volcanic mountains…and let yourself be enchanted by landscapes, events and testimonies on our planet Earth and the people who live on it, accompanied by beautiful, creative illustrations and pictures!"

The EGN Working Group "Volcanic Areas" has carried out continuous networking activities since 2014, with regular meetings and several joint initiatives, such as the booklet "Geoparks in Volcanic Areas in Europe" (edited in 2022 and available on-line) and the promotion of specific activities under the framework of "Volcano Day", a special date established among the WG members, on June 1st, during the EGN Week.

CREATIVELY CONVEYING THE THREE-COLOUR GEOLOGICAL HERITAGE AND THEIR SIGNIFICANCE AT MINÉ-AKIYOSHIDAI KARST PLATEAU ASPIRING UNESCO GLOBAL GEOPARK, JAPAN

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Keywords: Miné-Akiyoshidai Karst Plateau Geopark, limestone, anthracite coal, copper and argentum deposit, 3 colours

Miné-Akiyoshidai Karst Plateau aspiring UNESCO Global Geopark is located in western Japan and covers an area of 472 km^2. The Geopark consists of a basin area that is surrounded by mountains of around 700 m elevation, and has a warm and humid climate. It was recognised as a Japanese national Geopark in 2015, and is currently an aspiring UNESCO Global Geopark.

The three representative geological heritage of the Geopark are the seamount-type limestone of the Late Cretaceous-Permian, the coal (anthracite) strata of the Late Triassic, and the copper and silver deposits associated with igneous activity during the Cretaceous. These have been mined as far back as 1,300 years ago, and have influenced the people of Japan and society as a whole. In order to express these stories of the Earth and the lives of the people that have been nurtured by them as a regional identity, and to make this easily understandable particularly for local residents, the aforementioned rocks or stone products have been compared to the three colours of white, black, and red. These are used as the theme colours of the Geopark.

Local residents have developed a variety of activities using these three colours. For example, a local women's group has developed and begun selling takeout products featuring fried rainbow trout, which is a local specialty, that is sandwiched between buns that feature the three colours. Another women's group has created kamishibai (traditional story-telling with pictures) about the story of the Earth and its people in relation with each of the three colours, which they perform at schools and have published to sell as picture books.

Thus, the three colours are deeply engrained among local residents. On the other hand, it is difficult for tourists visiting the Geopark for the first time to understand the meaning behind the three colours. For this reason, a new illustration was created in 2025 to allow tourists and visitors to understand at a glance the three-colour geological heritage and the related natural and cultural heritage of the Geopark. This illustration will be used uniformly through a variety of media in conjunction with the three colours.

LINKING EDUCATION AND RESEARCH: A TERRITORIAL STRATEGY FOR SCIENTIFIC ENGAGEMENT IN THE VIANA DO CASTELO LITTORAL ASPIRING GEOPARK

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Keywords: education, Meaningful Learning, Natural and Cultural Heritage, School Network for Science and Research Support.

The Viana do Castelo Littoral Aspiring Geopark has been actively working on the conservation and enhancement of its natural and cultural heritage, aiming to valorize the territory through the promotion of scientific knowledge, sustainable tourism, and local development. Based on the three fundamental pillars defined by UNESCO, the project emphasizes the integration of science, education, and local communities as a strategic approach to strengthening the connection between people and their territory.

Recognizing the lack of scientific literacy regarding geological heritage as a major threat to its preservation, the Geopark developed a comprehensive educational strategy to raise awareness, foster a sense of belonging, and promote conservation through knowledge. Within this framework, the School Network for Science and Research Support (SNSRS) was created to deepen and disseminate knowledge about local heritage within the school community and promote scientific investment in the territory by R&D institutions.

Established in 2018, the SNSRS is structured into eight laboratory units, each dedicated to a specific discipline: Sedimentology, Geophysics, Petrology, Microscopy and Petrography, Vegetal Propagation, Photogrammetry, Science Communication, and Memory. These laboratories, hosted across seven school clusters, function as dynamic, interdisciplinary hubs for research and learning, extending the classroom into the surrounding landscape. By promoting innovative, project-based teaching in direct contact with geosites - as well as Special Areas of Conservation (Natura 2000), Archaeosites, Memory Sites, and Subaquatic Sites - the network transforms local heritage into a true open-air classroom and a catalyst for scientific curiosity.
Beyond the school context, the laboratories are also open to researchers, each with a scientific mentor, fostering collaboration and consolidating the network's role as a platform for knowledge exchange with tangible local impact. The SNSRS brings together students, teachers, and scientists in the study and valorization of the territory. This engagement fosters scientific thinking, shifting the view of science from a fixed product to an evolving process. It also helps challenge gender stereotypes in science and reduce dependence on textbooks, which often neglect the local context, limiting meaningful learning experiences. Moreover, it encourages students to see scientific careers as viable and fulfilling paths.
Use of the laboratories requires prior booking through the SNSRS website (www.redeescolardeciencia.pt) and ensures free transport for students and teachers, funded by the Municipality of Viana do Castelo. Since 2019, teacher training initiatives have empowered educators to explore the Geopark's heritage autonomously. A team of 28 *Teachers-Rangers*, trained through a specialized postgraduate programme, now promotes this mission in schools.

4GEON – GEOSCIENCE AS PLAYFUL KNOWLEDGE

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Keywords: geosciences popularization, international collaboration, geoschool concept, IGCP project, social media

The fundamental mission of geoparks is to create, interpret and share knowledge about their territory, geological phenomena and their connection to the local biota and the lives of local people. Starting in 2022, the 4GEON project is dedicated to promoting the transfer of geoscientific knowledge in geoparks of four continents: the Colca y Volcanes de Andagua UNESCO Global Geopark (UGGp), the Ngorongoro Lengai UGGp, the Bohol Island UGGp, the Rio Coco UGGp and the Barrandien National Geopark. The aim of the project is to use international cooperation and activate regional cooperation in the territories of participating geoparks to increase the interest and knowledge of local residents and Indigenous peoples about local geological phenomena and related natural and cultural heritage, as well as geological sciences in general. In addition to members of the participating geoparks, Brazilian students and geotourism experts are also participating in the project, contributing useful insights. Following two face-to-face project meetings in 2022 and 2023 in the Czech Republic, representatives of the Ngorongoro Lengai UGGp organized a face-to-face meeting in 2024, demonstrating the growing ability of participating geoparks to engage in international cooperation.

Support for international cooperation takes many different forms and makes comprehensive use of the possibilities offered by current ICT. A geoportal is being built jointly thanks to an editorial system that shares the knowledge of all participating partners, and online workshops are regularly held using MS Teams. The mobile application Toursman is gradually being introduced to the participating geoparks as a means of supporting regional cooperation in its creation and as a "soft" tool for visitor management. Another form of support for international cooperation is the joint creation of content for several social networks on Pinterest, Instagram, and Facebook, as well as on the project website, which promote the project and all participating geoparks and whose content is created in cooperation with the participating geoparks. Gradually, participating geoparks are also being provided with knowledge on how to create AI-generated educational illustrations using DALL E3 and tools in the social media platform Night Café. Structured content is created on Pinterest, which is gradually offered for use in geoschools. Regional cooperation is promoted through the "geobus" or " geoship" and networking among geoschools and 4GEON clubs.

The upcoming in-person project team meeting will be held in the Colca y Volcanes de Andagua UGGp, Peru in September 2025. In addition to the agreement on specific activities, a mutual exchange of geoschools between Barrandien National Geopark, Czechia and Ngorongoro Lengai UGGp will be initiated, which will lead to the further development of the geoschools concept in the other three participating geoparks.

BARRANDIEN NATIONAL GEOPARK – A JOURNEY ALONG THE BOTTOM OF THE LOST SEAS

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Keywords: geopark, Barrandien, interpretation, geological excursions, geoschools

The largest national geopark in the Czech Republic (4,316.3 km²) is located in three regions – Prague, Plzeň, and Central Bohemia. It consists of Proterozoic and Paleozoic bedrock. The area is particularly rich in paleontological heritage. All Paleozoic epochs can be found in the geological sites of the geopark, which gives this area a real heterogeneity in terms of presenting the evolution of the Earth, especially the fauna and flora associated with different eras. Only one other site covering so many epochs exists, and that is in China. In the 19th century, Joachim Barrande conducted extensive research in the Barrandien area, where he described over 100,000 fossil finds of more than 3,500 species. The geopark is also named after him. In the same century, Count Kaspar Maria von Sternberg, the founder of scientific paleobotany, also described fossil plants associated with coal deposits in the western part of the geopark. The geopark is involved in many activities, but its main mission is to popularize and interpret fossil finds and create fossil models that are used in the Geoschools project and during geological excursions.

As part of the Geoschools project, a geopark lecturer visits schools to teach classes using models and educate children about geology, paleontology, and the impact of geology on the surrounding environment. Geological excursions are led by a geopark guide who provides information about geology, paleontology, and nature. If participants find any fossils during the excursion, the guide will hand out educational cards about fossils so that they can correctly remember the species they have found.

The geomorphology of the geopark is characterized by high cliffs along the Berounka River valley and isolated rocks, small waterfalls, and caves, which give this place a special charm. The geopark area is valuable for its easy accessibility, well-preserved nature, and historical monuments, as well as its intangible cultural heritage. The hiking and cycling trails in these areas are very popular and relaxing. The geopark's administration consists of a management body and a scientific committee.

NARRATIVE OBJECT. AESTHETIC MEDIATION OF THE KÜTRALKURA GEOPARK, FROM NARRATION TO THE MATERIAL

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Keywords: object narrator, mediation, translation, territory, education

The Kütralkura Geopark was the focal point of the Creative Processes Workshop 5 of the Creative Crafts program at the Universidad Católica de Temuco. Through observation exercises, awareness-raising, information gathering, and local stories, in addition to experimentation with materials and forms, the students took on the role of territorial mediators. Aesthetic mediation involved assuming the role of translators and communicators between the park and the people, using materials, forms, and crafts as their language. Our guiding question was how does one translate a territorial narrative and integrate it into a situated creative process?

When faced with the task of working in the Kütralkura Geopark, we asked ourselves how we could integrate the territory as an author into the creative process of generating a work, which we call a narrative object. The students developed a permanent co-authorship with the territory and its language. The terms were given; they only had to learn to identify them in geological, biological, or environmental aspects, in textures, sounds, flavors and aromas, in color palettes, flora and fauna, or in the oral histories of the cultures that inhabited or still inhabit the place.

Initially, we conducted a survey of the area where the Kütralkura Geopark is located. Divided into groups and thematic areas, we explored the area using the information available in our libraries and then delved deeper into the students' personal interests.

Weeks later, we visited the Huellas de Lonquimay Reserve, accompanied by its director, anthropologist Carlos Guerrero. During the visit, we were able to corroborate the information gathered earlier and ask specific questions about it. We explored the area, listening to Carlos's stories, and experienced the place through our own senses.

After the visit to the park, we focused on determining the narrative that would shape the narrative object. This process guided the students' personal interests, paving the way for experimentation with evocative materials. The stories spoke of rock formations, ancient wanderers, or extinct species that still exist in the interpretation of constellations. Relevant information emerged from these stories that informed the process throughout the semester.

The exercise of translating the story into matter meant a shift in language, from words to shapes, colors, textures, sounds, aromas, and flavors. With this exercise, the experimentation with materials began: the story had to appear in form. During the creative process, the goal was not to artificially force forms, but rather to understand, in the final masterpiece, the operations or actions that made the results appear visible in the land.

Therefore, this workshop proposes a situated and replicable methodology for approaching a given territory: combining hard data with sensitive research, field observation, the collection of local stories, and material experimentation, thereby constructing and translating knowledge, with a sense of belonging, through a narrative object.

GEOSCIENTISTS, THE SCIENCE COMMUNICATION PRACTITIONERS IN UNESCO GLOBAL GEOPARKS

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Keywords: science communication, public engagement, geoscience communication, geoscientists

UNESCO Global Geoparks (UGGps) are recognized as dynamic platforms for science communication, particularly in the field of geoscience, with well-established practices that have been evolving for over 25 years.
According to the UNESCO Operational Guidelines for UGGps, Geopark teams must include geoscientists working on a daily basis (criterion iiiB). In this capacity, geoscientists are called to go beyond their traditional scientific roles. They are expected to bridge the gap between science and society, acting also as communicators, educators, facilitators and often even as marketers. Their mission involves engaging with diverse audiences to promote geoconservation and foster sustainable development.
The professional profile of a geoscientist in a Geopark requires not only geological expertise but also interdisciplinary skills, such as communication, interpretation, public engagement, mediation and facilitation or education, that are usually absent in traditional geoscience training and undergraduate courses.

As part of a broader research project on science communication in UGGps, key challenges were identified by combining a survey of geoscientists with a comparative study conducted across multiple Geoparks. The survey revealed patterns and profiles of communicators, showing that geoscientists' engagement with the public is influenced by both personal and contextual factors, such as their area of expertise or satisfaction with past experiences. It also highlights a gap between geoscientists' perceptions and practices, as well as a disconnect between science communication theory and its practical application. In the absence of structured training, practitioners often rely on traditional, experience-driven methods, overlooking evidence-based strategies.
Furthermore, a systematic benchmarking analysis of communication contexts confirmed that geoscientists typically work in small Geopark teams, with multiple roles and lack formal training in communication. On the other hand, despite a great wealth and variety of approaches, these often do not reflect well-supported strategies and fail to incorporate best practices grounded in science communication research, which undermines the effectiveness and impact of these strategies.
The findings recognize the challenging role that geoscientists play in this context and emphasize the importance of integrating public communication and engagement skills into geoscientist education, but, more importantly, highlight the need for specific training for professional development and the necessity of more interdisciplinary teams that include communication and science communication expertise.

By strengthening professionals' profiles and the capacity of Geoparks in these areas, they can further enhance their impact in fostering sustainable development and advancing the geosciences in society.

CHILDHOOD PLAY SPACES ACCORDING TO CHILDREN AND ADULTS FROM VILCÚN, CHILE

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Keywords: education, games, children, territory

In Chile, in the Araucanía region, Mapuche families live who have learned to coexist interculturally. Intercultural learning can be observed in everyday activities in the territory. One of these activities is for children to attend primary education, where they participate most of the time. This activity takes place in schools in rural and urban areas, where Mapuche and non-Mapuche children meet. In these schools, the State has promoted actions aimed at offering quality, equitable, and inclusive education for the social and cultural diversity present in the territory. In this territory, research focused on education has been conducted since the beginning of the XX century, specifically in the valley, where communes such as Temuco, Vilcún, and Padre Las Casas are located. As a result, it was evident that Mapuche children were dedicated to helping their families with daily tasks, including livestock raising. And, at that time, several children would gather together to play games that could be used for educational purposes.

In this sense, current scientific literature shows that these games 'embody values' inherent to the family, community, and the territory where children live. Therefore, children's games contain educational knowledge that contributes to their personal development. However, these games have been dimiched and made invisible in the schooling process. This problem affects the Mapuche people, as it leads to the forgetting and loss of this knowledge. Based on these assumptions, this qualitative research emerges, with the general objective of revealing the educational knowledge that children's games contain, according to the *kimche*, teachers, parents, and students from educational communities of rural primary schools in the Araucanía Region, for the development of individuals in contexts of social and cultural diversity. This is done with the aim of building a knowledge base that contributes to intercultural education.

As part of the research, a pilot study was conducted in the commune of Vilcún to test semi-structured interview scripts. Two children from different schools and two adults were interviewed. The information collected was analyzed using grounded theory techniques. The results indicate that children, through their play, express educational knowledge with less knowledge of the territory, unlike the adult participants with their childhood games. The study analyzes the effect of today's children playing primarily on school grounds. The adult participants' childhoods allowed them to play in large spaces within the school grounds and on school grounds. Consequently, the participants' personal development differs in their experimentation, exploration, and understanding of the natural environment. Within the framework of the *Kütralkura* Geopark conference, knowledge is being projected that can enhance future educational actions and/or policies that promote the use of park space for the benefit of children and their personal development, with intercultural and inclusive learning.

THE ESCARPÃO PLATEAU - A STUDY OF GEOLOGICAL SITES FROM THE ALGARVENSIS ASPIRING UNESCO GLOBAL GEOPARK TO PROMOTE GEOTOURISM AND EDUCATIONAL ACTIVITIES IN THE TERRITORY

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Keywords: Algarvensis aspiring UNESCO Global Geopark, Escarpão Plateau, jurassic, geotourism, geoeducation

Located within the boundaries of the Algarvensis aspiring UNESCO Global Geopark (aUGGp), the Escarpão Plateau is a unique geomorphological formation shaped by the interplay of fluvial, karstic, and tectonic processes. In 2019, during an inventory of geological interest sites in the Algarvensis territory, the Escarpão Plateau remained largely unknown to nature enthusiasts due to the presence of a quarry and an old municipal landfill. Consequently, local authorities had not previously considered it a site of interest for tourism activities. However, as a result of this work, the site emerged from the literature as hosting the most complete Upper Jurassic geological sequence in the Eastern Algarve. This discovery significantly increased its relevance for geotourism and underscored its role as a crucial water infiltration zone, prompting municipal efforts towards its protection. The plateau exhibits evidence of intense erosion caused by the Quarteira Rivulet, which carved a deep valley through this sedimentary sequence dating back from 161.5 to 145 million years ago. The sequence includes five geological formations deposited on a carbonate ramp associated with the Téthys Sea: the Peral Formation, Jordana Formation, Cerro da Cabeça Formation, Escarpão Formation, and the Limestone Formation containing *Anchispirocyclina lusitanica* (a foraminifera species), ordered from oldest at the base to youngest at the top. During the Quaternary period, karstification sculpted a landscape marked by thin, nutrient-poor soils, leading generations of inhabitants to adapt their agricultural practices and lifestyles to these constraints. The geomorphological features of the plateau and rivulet valley, the succession of carbonate formations, and the diversity of sedimentary and palaeontological records qualify this area as a potential nested geological site, a collection of smaller geosites of varying scale and interpretative potential within a broader geological context. To promote and safeguard this area, the Algarvensis Aspiring Geopark, in collaboration with the Albufeira Municipality (as a financial supporter) and the Centre for Marine and Environmental Research (CIMA) of the University of Algarve (as a scientific and field research partner), created an 8 km interpretative walking trail featuring 11 points of interest. These include geological, biological, cultural, and historical features, each accompanied by informative panels that illustrate the spatial and temporal aspects of the area's geological

heritage. Besides offering a new geotourism experience, part of the route was specifically

designed as a shorter educational circuit tailored for school groups and visitors seeking a deeper understanding. This initiative combines walking, science communication, and cultural and geological heritage interpretation into a single immersive experience. Today, the Escarpão Plateau functions as an outdoor classroom, frequently used for guided visits led by the Geopark's team of experts. These educational sessions involve students across various age groups and disciplines, such as natural sciences, geography, history, and environmental studies, who explore geological formations on-site while engaging in inquiry based learning supported by clear, contextual scientific explanations. In both geotourism and education, these visits also enhance the storytelling aspect of the Algarvensis Geopark. The Escarpão landscape transforms into a stage where science and narrative intersect, inviting participants to interpret not only the geological processes that shaped the territory but also the human stories connected to it. This holistic approach strengthens the Geopark's identity as a vibrant space for learning, memory, and shared heritage.

SUCCESSFUL USE OF YURU-KYARA JAPANESE-STYLE MASCOTS IN THE HAKUSAN TEDORIGAWA UNESCO GLOBAL GEOPARK

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Keywords: promotion, tourism, local recognition, popularity

In Japan, *yuru-kyara* refers to mascots that can be transformed into wearable costumes, commonly used to promote municipalities, companies, and various organizations. The majority of local governments in Japan have developed their own *yuru-kyara* to support regional branding and public engagement.

At an early stage of its development, the Hakusan Tedorigawa Geopark introduced an original *yuru-kyara* mascot pair—Yuki Mama and Shizuku-chan—in collaboration with a local graphic designer. These characters were specifically designed to reflect the unique narrative and natural features of the geopark, with an emphasis on being visually appealing and easily recognizable amid the numerous mascots that exist throughout the country. Hundreds of illustrated poses, along with a full-body costume, were created to support promotional efforts in print, digital media, and at public events.

Since their introduction, Yuki Mama and Shizuku-chan have gained widespread popularity among both local residents and visitors. The mascot's image is available for use by various organizations and groups within the geopark, provided that it is accompanied by the phrase “Official Mascot of the Hakusan Tedorigawa Geopark.” Due to the character's versatility and charm, she has been featured in contexts ranging from official municipal documents to educational and recreational activities for children. The costume is also available for rental, enabling broader community use in geopark-themed initiatives and events.

While the geopark also possesses an official logo, the mascots have proven to be significantly more popular. Since the launch of the project, applications for use of both the logo and the mascots have steadily increased, with the majority of requests focused on the mascots.

This case suggests that well-designed *yuru-kyara* mascots—particularly those that are cute, adaptable, and thematically relevant—can be more effective than logos in raising awareness of geoparks. Beyond promotional utility, such mascots can play an important role in fostering local identity and enhancing community engagement with regional heritage and values.

FROM VISION TO ACTION: GEO-EDUCATION IN PRACTICE AT JØSSINGFJORD SCIENCE MUSEUM

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Keywords: geo education, educational programs, interactive learning, collaboration

Since its opening in June 2024, Jøssingfjord Science Museum has emerged as the heart of Magma Geopark — serving as a hub for learning, exploration, and engagement. In spring 2025, new educational programs were officially implemented at the museum for the first time, bringing geology and Earth science to life for students through immersive, curriculum-based learning experiences.

We will introduce the structure and content of the new educational programs, which are offered to local schools across all five municipalities in Magma Geopark. Targeting 5th and 8th graders as well as high school students, the programs are based on curriculum relevant to each educational level and aligned with the museum's core themes.

We will share insights into how the programs were designed, why they took the shape they did, and what it was like to implement them in a museum setting. What did we learn? How did the students and teachers respond? What challenges did we face — and what opportunities emerged?

Geoparks have a responsibility to inspire younger generations and educate them about the Earth and its geological and cultural heritage — and we will present how we have worked to address this.

THE "TROJAN DINOSAUR": THE FANTASTIC AS A GATEWAY TO GEOCONSERVATION AND SUSTAINABILITY

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Keywords: paleontology, geodiversity, fossils, science communication, geoparks

Paleontology is often a gateway science into other scientific fields and academia. From an early age, we are introduced to giant dinosaurs and other extinct creatures from thousands or even millions of years ago, and this exposure usually sparks at least curiosity, if not long-term interest in the subject. In Geopark territories, paleontological heritage often stands out as one of the main expressions of geological heritage, already incorporated into the sense of identity of many local communities. Among all types of fossils, dinosaurs are undoubtedly the most popular and the most accessible for educational and outreach activities. Their appeal facilitates dialogue with diverse audiences and contributes to the development of public policies aimed at the preservation of geodiversity. It is essential to remember that fossils, although now incorporated into the lithosphere, were once living organisms and part of ancient biodiversity. They are records of the evolution of life and of the planet itself, connected to their environments, life and death processes, and the ecological niches they occupied. Therefore, studying and presenting fossils naturally fosters integration between the Geosciences and the Biological Sciences. Due to its interdisciplinary and multidisciplinary nature, paleontology has the potential to engage broad and varied audiences in a spontaneous and harmonious way. The purpose of this contribution is precisely to explore the fascination exerted by internationally relevant paleontological heritage, as found in Geoparks, as a starting point to introduce important topics that are less appealing to the general public. In this context, I have been using the term "Trojan Dinosaur" as a metaphor for a science communication strategy: using a highly popular topic as a hook to discuss issues such as climate crisis, spatial and temporal scales, plate tectonics, depositional systems, public policies for geoconservation, and the Global Geoparks Network. One practical example of this approach was the talk "What can dinosaurs tell us about the climate?", presented during the 2025 Pint of Science event at Uberaba UGGp. The audience, initially drawn in by the dinosaur theme, was invited to reflect on the geological time scale and the climate changes that occurred during the Mesozoic Era, in comparison with the abrupt changes observed over the last 150 years. This methodology has proven effective in engaging people who would otherwise be unlikely to explore such topics. The "Trojan Dinosaur" has proven to be an ideal approach for the Uberaba UGGp, whose main heritage focus is paleontological, especially centered around large dinosaurs. However, the concept can be adapted to any Geopark with prominent heritage elements capable of attracting the interest of both local communities and visitors.

GEO-SCHOOL AND GEO-DREAM: ENHANCING EDUCATIONAL EQUITY AND SOCIAL INCLUSION THROUGH GEOPARK PROGRAMS IN KOREA

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Keywords: geo-education, geo-dream, geo-school, geoparks in Korea, community outreach, SDGs

Geo-School and Geo-Dream are inclusive educational initiatives operated by the Korean National Geoparks Secretariat to expand the societal role of geoparks beyond conservation and tourism. These programs aim to raise public awareness of geoheritage while promoting equitable access to geoscience education for marginalized groups. Since 2016, the Geo-School program has provided field-based geoscience education to over 4,400 secondary school students across Korean national geoparks. In partnership with the Korean Earth Science Teachers Association, the program offers hands-on learning experiences at significant geological sites. In 2025, the program conducted three events at Hantangang and Hwaseong Geoparks, engaging 150 students and teachers. The Geo-Dream program, launched in 2017, focuses on social inclusion by supporting the participation of vulnerable groups—including low-income families, the disabled, and multicultural or single-parent households—in geopark educational activities. As of 2024, a total of 4,772 people have participated in 203 program events. In 2025, the program funded two projects in Goseong (Gangwon Province) and Jinan (Jeollabuk-do), involving 353 participants through 23 separate activities. Both initiatives represent best practices in integrating UNESCO Global Geoparks with inclusive education and community outreach. They contribute to the Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education) and SDG 10 (Reduced Inequalities), by making geoscientific knowledge accessible to diverse audiences. These cases demonstrate how geoparks can function as platforms for ecological welfare and lifelong learning.

ESTRELA UGGP: A LIVING LABORATORY FOR LEARNING

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Keywords: education, Living laboratory, UNESCO Global Geoparks

Through Education, the ordinary citizen, who usually has little knowledge about Geosciences and its importance for society, easily perceives how geodiversity predetermines the natural and human development, contributing to promote a more conscious and sustainable society. In this context, UNESCO Global Geoparks have a leading role because as territories with a remarkable geological heritage and where strategies for the protection and enhancement of natural heritage are developed, they contribute to bringing Geosciences closer to the community, raising awareness towards the protection of the environment, thus contributing to the adoption of sustainable attitudes. In this context, the Estrela UNESCO Global Geopark has focused on developing educational programmes, as education is the most important tool for preserving natural and cultural heritage.

The territory has an educational offer that includes activities in the fields of Formal, Non-Formal and Informal Education. In the context of formal education, which is education that takes place in schools, there are various activities that are carried out in the classroom, encompassing lectures, workshops and experimental activities on various topics, allowing students to work on different cross-cutting themes. With regard to non-formal education, which is education that takes place outside of schools and includes organised and structured activities that complement formal education, there is an offer of a number of outdoor educational programmes that include field trips and guided tours to museums and interpretation centres, allowing participants to use the territory of Estrela as a living laboratory, an outdoor classroom that offers its resources so that all can better understand the history of our planet. Finally, in regards to informal education, which is learning based on everyday experiences, work and leisure time, the joint work between the Estrela UNESCO Global Geopark and its municipalities and local partners has allowed the local communities to better immerse themselves in the creation of sustainable strategies based on knowledge.

Attesting to the importance of education in the territory are the numbers associated with all of the activities promoted: for formal education, almost 22 000 students have participated in activities; for non-formal education, almost 12 000 students and teachers; and for informal education, approximately 10 000 participants.

With the above, it is clear that the territory of the Estrela has gained a significant boost with the application and consequent designation as a UNESCO Global Geopark. Education has been one of the main pillars in the territory's strategy, and through its educational programs, it has helped raise awareness about the heritage of the territory and the need to preserve it, making everyone involved true keepers of a mountain that seeks to affirm itself as a true living laboratory for sustainable development.

INTERDISCIPLINARY FOR CONSERVATION: MATHEMATICS EDUCATION AND ECOLOGY IN THE KÜTRALKURA GEOPARK

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Keywords: interdisciplinary education, mathematical modelling, ecological awareness, trophic networks, geopark-based learning

The UNESCO Global Geopark Kütralkura, whose name means "Stone of Fire" in the Mapuche language, is located in the Araucanía Region in southern Chile. This territory, characterised by intense volcanic activity, hosts remarkable biological and cultural diversity. Within its boundaries lies Tolhuaca National Park, established in 1935, whose name means "cow's tongue" in Mapudungun. Considering the need to protect and care for the environment in this area, a trophic network problem was designed and implemented in the course Elements of Advanced Calculus at the Universidad Católica de Temuco for pre-service mathematics teachers, promoting an interdisciplinary approach in the classroom by integrating biology and mathematics to address the problem [1]. During the problem-solving process, a group of students visited the park and, unexpectedly, as detailed in this study, identified the presence of the monito del monte (Dromiciops gliroides), a small marsupial endemic to the temperate forests of Chile and Argentina, with nocturnal habits and an omnivorous diet. This finding sparked a deep interest in the park's biodiversity and motivated the design of mathematical models to represent the ecological interactions involving this species. Possible scenarios of species coexistence or extinction were analysed based on the structure of the trophic network. Mathematical modelling facilitated the generation of realistic predictions about the ecosystem's dynamics, making a valuable contribution to the planning of conservation actions for the park and its species [2]. This study highlights the role that pre-service mathematics teachers can play when their disciplinary courses incorporate the care of the Kütralkura Geopark. They could have a meaningful impact on school communities in the Araucanía Region by creating interdisciplinary school projects focused on ecological awareness and linked to the Geopark, similar to other successful educational initiatives between geoparks and universities around the world [3], which have fostered active citizenship and commitment to the conservation of natural and cultural heritage.

GEOLOGICAL KNOWLEDGE THROUGH DIGITAL TWINS: A CASE STUDY FROM THE GEOLOGY LABORATORY

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Keywords: digital fabrication, rock and mineral digitization, interdisciplinary design, Rapid Prototyping, geoscience education, Digital Twins

Introduction

The School of Design at the Catholic University of Temuco is renowned for integrating digital and automated fabrication technologies with traditional techniques and materials of significant symbolic value. This approach is rooted in a systemic perspective that emphasizes territorial and contextual considerations.

Methodology

This study outlines the methodology developed in the "Rapid Prototyping" course, which centered on an interdisciplinary project involving the digitization, mesh correction, fabrication, and creation of a digital repository of rocks and minerals from the university's Geology Department. The digitization workflow established during the course is designed to be scalable, with the goal of supporting future initiatives within the UNESCO Global Geopark Kütralkura.

Results

The implementation of this methodology led to the digital reconstruction of more than thirty rock and mineral specimens. These samples were provided in collaboration with the Department of Geology, which supplied the materials for study and analysis.

Discussion

This section focuses on the scalability of the proposed methodology and highlights the significance of incorporating contextual information for each specimen. Future efforts will be directed toward developing a mobile photographic laboratory capable of capturing in-situ samples while accurately documenting their origin and geographic location, all with minimal environmental impact.

VISUAL GAMES PROPOSAL ABOUT THE KÜTRALKURA GEOPARK AS AN EDUCATIONAL TOOL FOR YOUNG CHILDREN

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Keywords: educational games, young children, education, Kütralkura Geopark

A geopark involves three fundamental pillars: education, conservation, and sustainable development. The Kütralkura Geopark is located in south-central Chile and has a website that provides information so the public can learn about the geopark. Within this, there are trivia questions about wildlife, cultural heritage, and geodiversity to foster children's interest and knowledge. However, these games can be a bit challenging for young children, as they require a certain level of reading comprehension and knowledge. Therefore, three visual games are proposed that, in addition to the existing trivia, can promote education about geodiversity and wildlife among younger children. The proposed games are: i) Memorize: A set of duplicate images is hidden behind a logo, and they must be clicked on to reveal them before they are hidden again, in order to match the images with their copy. ii) Guess who I am: On one side, complete images are displayed, and on the other side, only specific parts, for example, a complete image of a tree and an image of just one leaf of that tree; this way, the specific images that correspond to each general image must be matched. iii) Do you know my name?: There is a set of images available and a box with the names of what is shown in the images (such as types of sedimentation or rocks, flora or fauna), and the objective is to match the image with the corresponding name. With these three activities, young children can become familiar with the Kütralkura Geopark in a visual, simple, and fun way. These games would be available on the Kütralkura Geopark website and local schools would have access to it as an educational tool. This would increase awareness about the Geopark among the younger population, encouraging interest and good practices from an early age. Additionally, as a future improvement, it is suggested that sounds from the fauna that inhabit the Geopark be included in the database. This will allow to develop a new activity in which children can not only recognize the appearance of the fauna through images, but also associate it with the sounds the animals make.

FROM UNESCO GLOBAL GEOPARK TO "NATURE SCHOOL" A CASE STUDY OF MOUNT DANXIASHAN

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Keywords: Mount Danxiashan, UNESCO Global Geopark, Nature Education, Nature School

Delivering high-quality nature education services to the public is important to the sustainable development of UNESCO Global Geoparks. In accordance with the 2024 assessment requirements set by UNESCO experts, Danxiashan UNESCO Global Geopark has explored its experience in developing a "Nature School" and aims to share it with the international community. Using Danxiashan UNESCO Global Geopark as a case study, this paper analyzes its "Nature School" model. The findings reveal that transforming a geopark into a "Nature School" can be achieved through four interlinked strategies: identifying nature-education resources, improving the supply of nature education programs, nurturing a nature education market, and building a distinctive nature education brand. Establishing such a school supports the upgrading of geotourism, raises the incomes of local residents, and strengthens their sense of place. This study offers practical references for the sustainable development of other UNESCO Global Geoparks.

GEOEDUCATION FOR TRANSFORMATION: "THE GEOPARK IS MY SCHOOL" INITIATIVE ALGARVENSIS ASPIRING UNESCO GLOBAL GEOPARK

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Keywords: geoeducation, community engagement, school initiatives, SDG 4, UNESCO Global Geoparks

What if a school could extend beyond its walls and become a part of the landscape itself? In southern Portugal, the aspiring Algarvensis UNESCO Global Geopark (aUGGp) is making this vision a reality through a Strategic Geoeducation Plan that places education at the heart of its mission. Its flagship initiative, "The Geopark is My School", will be launched in 2025/2026 across all school clusters of Loulé, Silves, and Albufeira, transforming the territory into a living classroom where students and teachers co-create knowledge through direct contact with local heritage. This initiative aims to bring learning outside the classroom and closer to the land, cultivating a strong sense of belonging, critical thinking, and sustainability values. Schools will be encouraged to develop interdisciplinary projects rooted in the geological, biological, cultural, and intangible heritage of the territory. Each school will collaborate closely with the Geopark's educational and technical team to design and implement a project tailored to its context, exploring themes such as geodiversity, biodiversity, climate change, water, the ocean, traditional knowledge, and cultural identity. A key resource in this approach is the educational kit "The Chest of Hidden Treasures", designed to inspire curiosity, creativity, and investigation. The Chest contains rocks and fossils, maps, storytelling prompts, activity cards, sensory items, and challenges linked to real places in the Geopark. It can be used both in the classroom and outdoors, helping teachers plan field trips, creative workshops, storytelling sessions, and hands-on learning activities. Through the Chest, students build emotional connections with their territory while exploring curricular content in innovative, experiential ways. The methodology promotes student-led learning, cross-disciplinary exploration (e.g., science and arts, geography and literature), and active community involvement. Examples of activities include thematic walks, school exhibitions, interviews with elders, artistic interpretations of local stories, or mapping exercises. Teachers play a central role as mediators and co-creators, supported by training sessions, pedagogical guidance, and interpretive materials tailored to different age groups.

The initiative is structured around four strategic goals: 1) Integrate Geopark themes into school

curricula through place-based learning; 2) Promote meaningful student projects that link local heritage to global challenges; 3) Foster creativity and emotional engagement through storytelling, fieldwork, and artistic expression; 4) Encourage cooperation between schools and generations, sharing good practices and strengthening territorial identity. A monitoring

framework will assess each project through indicators such as student engagement, curricular integration, community participation, and the creation of meaningful educational outputs. The initiative aligns with the Sustainable Development Goals (SDGs 4, 13, 14, 15, and 17), positioning education as a transformative force. By transforming students into active interpreters and guardians of the Algarvensis territory and positioning teachers as co-authors of place based education, the project goes beyond schooling. It cultivates future citizens rooted in identity, guided by science, and engaged in building a more sustainable world. The model can be replicable and adaptable for other Geoparks seeking to align education, identity, and sustainability through the active participation of school communities.

REGIONAL AND INTERNATIONAL UNESCO COLLABORATIONS



THE IMPORTANCE OF EUROPEAN FUNDS FOR THE SUSTAINABILITY OF GEOPARKS IN PORTUGAL

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Keywords: European funds, UNESCO, sustainable development, Portugal 2030, natural heritage

Geoparks play an essential role in conserving natural heritage, promoting environmental education, and ensuring the sustainable development of low-density areas. However, in Portugal, most of these areas depend much on European funds to operate. And the lack of continuous funding poses risks.

Geoparks, as territories recognized by UNESCO for their geological, ecological and cultural significance, are becoming increasingly important in sustainable territorial development strategies. In Portugal, there are six geoparks integrated in the UNESCO Global Geoparks Network: Naturtejo, Arouca, Terras de Cavaleiros, Açores, Estrela and Oeste. These territories are drivers of local development, especially in inland regions marked by depopulation, ageing and low economic attractiveness. However, unlike other public or private institutions, geoparks do not have their own regular income. Their operational subsistence and the implementation of their action plans depend largely on European funds, especially those made available by Community support frameworks (FEDER, Portugal 2030, among others).

The financial sustainability of geoparks in Portugal is closely tied to their ability to get EU funding. These funds are used for the construction and maintenance of interpretive and scientific infrastructure; environmental education and geological heritage awareness programmes and involvement of local communities; tourism promotion and economic enhancement of endogenous resources; participation in international networks and compliance with UNESCO criteria.

Without access to these sources of funding, most of the activities envisaged in the geoparks' strategic plans would become unfeasible.

In the case of Naturtejo Geopark, through funds from *Portugal 2030*, we invested in environmental education, created new trails, international events, school partnerships and scientific dissemination activities in a sparsely populated region. These investments became catalysts for nature tourism and the enhancement of local identity.

Excessive dependence on EU funds poses structural challenges. Discontinuity between funding frameworks can cause disruptions in geopark activities and jeopardize the UNESCO certification. The lack of structured and permanent national funding, combined with the difficulty of generating sufficient own revenue, jeopardizes the continuity of education, conservation and local development actions. Furthermore, the eligibility criteria for European funds are not always suited to the multidisciplinary and territorially integrated nature of geoparks, requiring greater flexibility in the design of specific support programmes for this type of territory.

Geoparks are instruments of great strategic value for the enhancement of Portuguese territory. However, their viability depends heavily on European funds, which have enabled projects with educational, environmental, economic and social impact to be implemented. It is essential to ensure that, within the framework of future public policies, geoparks benefit from more stable and multi-annual funding models, to ensure the continuity of their actions and the fulfilment of international commitments with UNESCO.

Investing in geoparks means investing in a sustainable, inclusive and innovative development model capable of responding to the challenges of the inland areas, ecological transition and environmental education.

SPANISH GLOBAL GEOPARKS NETWORK. AN ALLIANCE OF 18 TERRITORIES

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Keywords: Regional and International UNESCO collaborations, geoparks network, recognition and regulation

The Spanish Global Geoparks Network is compossed by 18 territories that are UGGp, as well as five individual members of the GGN. It was formed under the umbrella of the GGN and belongs to the European regional network, EGN. From one of the founding Geoparks of the European Geoparks Network to the latest member in 2025, 16 geoparks have gradually joined until today.

In 2011, the Spanish Geoparks Forum was established following the European Network's guidelines for national geopark forums. The Forum later adopted the name of the Spanish Geoparks Network (REGM) and was established as a permanent working group attached to the Spanish National Committee for UNESCO Global Geoparks. This Committee reports to the Spanish National Commission for Cooperation with UNESCO (CNECU) within the Spanish Ministry of Foreign Affairs, and its main mission is to liaise with UNESCO for the implementation of the UNESCO Global Geoparks Programme in Spain. In addition to the CNECU, various representatives from the Spanish Government—IGME, Environment and Protected Areas, Tourism, Culture, Rural Development—also participate, as well as representatives from the autonomous communities with geoparks, representatives of the geoparks, and other experts.

As a result of the intense joint work as a network, new needs have emerged to address issues such as operating as a network (covering website costs and other joint promotions), accessing financial funds, grants, and other projects requiring legal status. In June 2025, the UNESCO Spain Geoparks Association was registered, which has so far grown to five members and will soon be joined by the other Geoparks.

This will be a significant boost for Spanish geoparks, which are undoubtedly already stronger and more visible, and have the tools to deepen both national and international cooperation. Among the upcoming challenges facing the Spanish Geopark Network at the national level are greater legal recognition of the geopark concept—enshrined in Law 42/2007 but not yet developed—the official creation of the Spanish National Geoparks Committee (CNEG), their promotion as sustainable and innovative destinations, and, ultimately, their recognition as development territories that enhance their heritage and where cooperation is at their core.

WORKSHOP - GLOBAL GEOPARK NARRATIVE: CONNECTING THE DOTS BETWEEN THE GEOPARKS BY TELLING THE STORY OF MOTHER EARTH

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Keywords: geopark storytelling, geological time spiral, interactive workshop, cross-geopark collaboration

How can Geoparks contribute to reconnecting people with our living planet and raising more awareness about this common story and the globe we share? Different Geoparks tell a different part of this story about the biological, chemical and geological events that took place and can be experienced within Geoparks around the world.

Schelde Delta UNESCO Global Geopark for instance tells the story of the Holocene. Its geology, largely hidden beneath the surface, is shaped by millennia of coastal and riverine processes that continue to this day. Unlike dramatic mountain ranges or striking rock formations in other geoparks, our landscape tells its geological story in subtle, layered ways—through tidal rhythms, sedimentation, and human interactions with land and water. The soft sediments that can be seen within the Geosites of Schelde Delta however explain how geological phenomena in other Geoparks were once formed.

This workshop explores how other Geoparks each tell their part of the history of earth and explores the opportunities to make inspiring connections to enrich the story of each participating Geopark and raise the connection about the living planet we share.

We start from two perspectives:

Geological Time Spiral:
On a global scale, the GGN geological time spiral is a way to tell the story of our earth. Can we link the different Geoparks participating in this workshop using the spiral ? Does it cover all parts of history ? Which biological, chemical or geological events are lacking ? Is there experience in visualising this geological time spiral and how could we do this ?

Towards a visualisation of geological layers in an augmented Reality sandbox:
Connected to this global narrative, Museums in Geopark Schelde Delta are now using the Augmented Reality Sandbox to explain the forming of landscape and geography on a more regional level. Since most of the geology in Schelde Delta is very subtle, or even hidden underneath the mowing line, we are looking for a way to make the geology and landscape more tangible in an interactive way.

We warmly invite other Geoparks to share their approaches to similar challenges. How do you make the invisible visible? And how can we, together, build experiences that can not only make it more easy to read the landscape but also get a better understanding of the layers beneath the mowing line and the way they are connected in the different geosites.

THREE UNESCO DESIGNATIONS, ONE TERRITORY: INTEGRATING NATURAL AND CULTURAL HERITAGE IN TERRAS DE CAVALEIROS UGGP

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Keywords: geoparks, sustainable local development and geotourism

The municipality of Macedo de Cavaleiros, in northern Portugal, hosts three distinct UNESCO designations: the Terras de Cavaleiros UNESCO Global Geopark, the Iberian Meseta Transboundary Biosphere Reserve, and the Intangible Cultural Heritage of Humanity associated with the Winter Festivities - most notably the Caretos de Podence tradition.

This presentation explores how these three heritage frameworks (two UNESCO-designated sites and an element of cultural heritage) are promoted in a cohesive and synergistic manner within the same territory, under the coordination of a single management structure - the geopark itself and its team - which actively champions all three labels in its daily operation.

The geopark concept, by its nature, serves as an umbrella for these designations, providing a flexible and inclusive framework that can effectively integrate natural and cultural heritage elements. Due to its broad mission, the geopark is uniquely positioned to manage and coordinate these overlapping designations, ensuring that each one thrives within a collaborative and mutually reinforcing strategy.

The geopark systematically incorporates the biosphere reserve into all its communication, educational, and touristic actions. Joint initiatives are carried out with transboundary partners, and a dedicated Interpretation Centre was recently inaugurated to highlight the values and governance of the biosphere reserve.

At the same time, the geopark plays a leading role in promoting the region's intangible cultural heritage. It is responsible for organising the iconic Carnaval de Podence, and ensures the dissemination and celebration of the Winter Festivities in all outreach, exhibition, and educational initiatives - both nationally and internationally.

In the context of Multi-Internationally Designated Areas (MIDAs), the integrated management of these overlapping designations is crucial to maximize the benefits of each designation while addressing any potential conflicts.

The convergence of geological, ecological, and cultural narratives within a single territorial strategy has contributed to a powerful sense of identity, strengthened sustainable tourism, and fostered innovative models of participatory and cross-border cooperation.

FROM LOCAL VOICES TO GLOBAL ACTION: CO-CREATING A YOUTH DECLARATION IN UNESCO GLOBAL GEOPARKS

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Keywords: youth engagement, intergenerational partnerships, and collaboration among UNESCO-designated sites

This presentation will explore the Canadian experience of developing a national Youth Declaration for UNESCO Designated Sites as a model for meaningful youth engagement in the Canadian Geopark Network and MAB Programme. Co-led by the Canadian Commission for UNESCO and youth representatives from across the country's Global Geoparks, and Biosphere Regions, the declaration was a symbolic yet practical initiative to connect young people to the global vision of UNESCO all while anchoring their work in local realities. The session will highlight key aspects of the youth declaration's development and impact. We will notably discuss the circumstances which led to the creation of the youth declaration, the tangible case studies from throughout Canada, the collaborative process of forming a youth drafting group, engaging mentors and site managers, and aligning grassroots perspectives with the UNESCO Global Geopark mandate.

The objectives of this presentation are threefold: (1) to inspire other countries to initiate similar youth-led processes that foster national networks, (2) to emphasize the role of mentorship and intergenerational collaboration in sustaining youth participation, and (3) to prompt site managers to take youth engagement seriously as a strategic and structural investment, not a symbolic gesture. Participants will leave with a practical framework for initiating youth declarations, strategies to build capacity among young leaders, and tools to make UNESCO sites places where youth shape the future.

PORTUGUESE-SPEAKING GEOPARKS, AN EXAMPLE OF PARTNERSHIP - OESTE UGGP (PORTUGAL) AND SERIDÓ UGGP (BRAZIL)

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Keywords: Regional and International UNESCO collaboration

Oeste UNESCO Global Geopark (Oeste UGGp) has been part of the International Geoscience and Geoparks Programme (IGGP) and Global Geopark Network (GGN) since March 2024. Between 2020 and 2024 the Oeste UGGp team visited and studied all Geoparks in Portugal, but also many Geoparks around the world, such as European, Asian and South American Geoparks.

Due to their geographical proximity, agreements were established with each of the Geoparks in Portugal and for reasons of linguistic proximity, there was a greater rapprochement with the Geoparks in Brazil.

The Seridó UGGp (Brazil) has been part of the IGGP and GGN since 2022 and was one of the examples that the Oeste UGGp followed in its process, particularly in the areas of communication and geoeducation. This work led to the signing of the Oeste Geopark's first international agreement in 2022 and subsequently to several visits by the technical teams to the respective territories.

With this agreement, the technical team of Seridó UGGp was able to visit the territory of Oeste UGGp several times, always with the aim of exchanging experiences and good practices between partners. There was also the opportunity for Oeste UGGp to also visit the territory of Seridó UGGp. Thematic and commemorative webinars were also co-organized by both UGGp. This environment of cooperation has also allowed the development of projects in the area of tourism, involving both territories.

All this activities are proof that geodiversity is not always the main reason for developing partnership programmes between UNESCO Global Geoparks. The Oeste UGGp continues to take the work carried out by the Seridó UGGp as an example, particularly in terms of communication, geoeducation, geoconservation and geotourism. Also noteworthy is the close relationship with local communities, an example of good practice for the Oeste UGGp.

As a conclusion, we highlight the importance of sharing the same language in bringing together two territories located on different continents, but also the development of an informal mentoring programme, where an UGGp continuously supports an aspiring Geopark (aUGGp) in its classification process.

WEBINARS OF THE OESTE-UBERABA GEOPARK COOPERATION AGREEMENT: CONNECTING TERRITORIES AND PEOPLE ACROSS TWO CONTINENTS

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Keywords: Regional and International UNESCO collaborations

The Oeste UNESCO Global Geopark (Portugal) and the Uberaba UNESCO Global Geopark (Brazil) were officially designated as members of the UNESCO Global Geoparks Network on March 27, 2024. In addition to this milestone, both territories share the Portuguese language and a geological focus on Vertebrate Paleontology, especially dinosaurs. Interestingly, the dinosaur fossil-bearing rocks in the Oeste UGGp territory date to the Jurassic Period (Kimmeridgian-Tithonian), while those in the Uberaba UGGp belong to the Cretaceous Period (Campanian–Maastrichtian), complementing each other in the evolutionary history of these animals and the Earth itself. As part of the Cooperation Agreement between Oeste UGGp and Uberaba UGGp, a series of five webinars is being held in 2025 to promote the identity and heritage of both territories, highlighting their commonalities and unique features, highlighting their common points and unique characteristics, but above all highlighting the three pillars of a UGGp - Science, Geoeducation and Geotourism. Considering these three pillars, a series of webinars was created that aim to be the motto for the exchange of experiences and good practices between these two territories, but also the beginning of an intercontinental networking process between the two local communities, economic, social and academic partners. At the time of writing this communication, the following webinars have already taken place: “Paleontology: the science that unites two continents,” “Heritage and Geoparks: a bridge between Uberaba and Oeste,” and “Carnaval, a tradition that connects two continents (Customs and Traditions)”. Scheduled for later this year (by September) are the webinars “Sustainable Gastronomy in UNESCO Global Geoparks” and “Tourism and Education”. Each webinar features a moderator and four invited speakers, two representing Oeste UGGp and two representing Uberaba UGGp, all with direct ties to the territories they represent. These events are broadcast live on the Oeste UGGp YouTube channel and remain available for later viewing, allowing a broader audience to engage with the content over time. This series of webinars is just the first step in an action plan that aims to strengthen the relationships between these two UGGp, their communities, and their social and economic ecosystems. It is considered that this example can be a good practice to be replicated in other partnership projects between UGGp. Therefore, with this initial action and the presentation of this Agreement, it is expected that the communities of the territories will broaden their perception of their own heritage and understand how it can both influence and be influenced by geographically distant territories, yet share similar characteristics and spirit.

CONTRIBUTIONS TO THE CREATION OF GEOPARKS IN THE COMMUNITY OF PORTUGUESE SPEAKING COUNTRIES: THE 1ST INTERNATIONAL FORUM

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Keywords: Community of Portuguese Speaking Countries, international forum, Global Geoparks Network, UNESCO

The 1st UNESCO Global Geoparks Forum of the Community of Portuguese-Speaking Countries (CPLP) will be held in Arouca UNESCO Global Geopark (Portugal), from 27 to 30 May 2026. This event, will be organized by AGA – Arouca Geopark Association, Arouca Municipality, the Portuguese UNESCO Global Geoparks Network and the recent UNESCO Geoparks Network in the CPLP countries, with the strong institutional and financial support of Turismo de Portugal, the national tourism authority.

This initiative is founded on the observation that, within the CPLP context, UNESCO Global Geoparks are currently only present in Portugal (Arouca, Azores, Estrela, Naturtejo, Oeste, and Terras de Cavaleiros) and Brazil (Araripe, Caçapava, Quarta Colónia, Seridó, Southern Canyons Pathways, and Uberaba). Furthermore, the common language offers a strategic benefit for enhancing communication and collaboration in the development of geoparks across CPLP nations, including Angola, Cape Verde, East Timor, Guinea-Bissau, Mozambique, Equatorial Guinea, and São Tomé and Príncipe. This event welcomes participation from all stakeholders interested in these subjects, with a particular encouragement for attendees from CPLP countries, thereby reinforcing the community's dedication to international cooperation within the Global Geoparks Network framework.

The main aim of the event is to strengthen co-operation in the creation, promotion and management of existing UNESCO Global Geoparks in CPLP territories, in line with the mission of the Global Geoparks Network.

The organization has defined five themes for debate during the event: Geological Heritage and Geoconservation in Geoparks; Development strategies in Geoparks: from communities to governance; Geoparks: territories for sustainable and responsible tourism experiences; Communication, Education and Science in Geoparks; Challenges and opportunities for the creation of Geoparks in the CPLP.

Participation is open to all those interested in one or more of these general topics, and the organization particularly encourages the participation ~~of~~ from people of CPLP.

GLOBAL GEOPARKS NETWORK: PROTECTING AND MANAGING EARTH HERITAGE - BUILDING SUSTAINABLE COMMUNITIES

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Keywords: UNESCO Global Geoparks, Global Geoparks Network, earth heritage, sustainable development

The Geopark concept was introduced at late 90's aiming to protect and promote Earth heritage sites through the sustainable local development of territories containing abiotic nature of significant value.

The Global Geoparks Network (GGN) was established in 2004, under the umbrella of UNESCO and operates as an international network, providing a platform of cooperation among Geoparks, bringing together government agencies, non-governmental organizations, scientists and experts from all countries around the world in a unique worldwide partnership.

In 2015, the 38th UNESCO General Conference ratified the statutes of the International Geoscience and Geoparks Programme and the UNESCO Global Geoparks Operational Guidelines, introducing the brand UNESCO Global Geopark as a label of excellence for areas that meet certain criteria. Since then the Global Geoparks Network was recognized as the official partner of UNESCO for the operation of the UNESCO Global Geoparks.

In 2025, the GGN includes 229 Geoparks in 50 countries working to protect Geological heritage and promote local sustainable development.

The GGN organizes co-operation and mutual assistance between Global Geoparks and between Global Geopark professionals.

The GGN initiates and co-ordinates Regional Geoparks Networks which will foster international co-operation and promotion of sustainable development.

The GGN represents, advances, and disseminates knowledge in Geodiversity management and other disciplines related to studies in Geo-conservation, Geo-tourism, Geo-education and/or the management and activities of Global Geoparks.

An important component of the Geopark management plan is the support of the local economy. Geoparks create links with local tourist enterprises, restaurants and small hotels in order to provide the necessary infrastructure to meet the needs of the increasing number of park visitors. As a result many new enterprises are connected with the activities of the Geopark.

The Geopark also supports the making of local handicrafts such as the production of fossil casts and souvenirs by local enterprises. These items are on sale in the Geopark shop along with a variety of other locally made products and the Geopark promotes these products to its visitors.

Geoparks also collaborates closely with women's agrotouristic cooperatives and local organic food producers to offer their visitors the opportunity to taste and buy local food products. The catering for all Geopark events (conferences, meetings etc.) is supplied using the local

traditional food. The Geoparks organize Agro-touristic festivals, which promotes quality local products, food and drinks. The Women's agrotouristic cooperative found that this festival provided them with an excellent opportunity to promote their products and their success lead to the creation of similar cooperatives in other villages

Geoparks contribute significantly to territorial development by directly and indirectly creating new jobs. But what is even more important for the employment in the area is the number of other job opportunities which are created in tourist enterprises, small hotels, guest houses, restaurants and other activities connected with the increase of tourist flow in the Geopark area. Several other local artisans, such as makers of handicrafts and ceramic fossil casts, carpenters, and blacksmiths, are permanent collaborators with the Geopark.

PROSPECTS AND CHALLENGES IN THE PURSUIT OF THE HANTANGANG TRANSNATIONAL UNESCO GLOBAL GEOPARK

Jisung Kim

Geologist of the Hantangang UNESCO Global Geopark

Hantangang Geopark possesses strong potential for development into a UNESCO Global Trans-boundary Geopark in collaboration with the Democratic People's Republic of Korea (DPRK).

During the park's initial designation in 2020 and revalidation in 2024, UNESCO consistently recommended expanding its boundaries to include the upper reaches of the Hantangang River and associated lava plateaus located in the DPRK. Sustained commitment and cross-border dialogue are necessary to pursue this vision.

Recent developments in the DPRK—such as the designation of Mt. Paektu as the country's first UNESCO Global Geopark (2024) and Mt. Kumgang as a UNESCO World Mixed Heritage Site (2025)—demonstrate growing engagement with international conservation frameworks. This indicates a potential openness to future cooperation, especially if mutual benefits are clearly identified.

To advance the trans-boundary initiative, a long-term strategic approach is required. This includes establishing a formal Trans-boundary Geopark Committee, engaging with relevant South Korean ministries such as the Ministry of Unification and the Ministry of Environment, and securing support from the international community.

As an essential first step, the establishment of an independent, integrated Hantangang Geopark Secretariat is recommended. This would serve as a foundation for lowering tensions in the border region while fostering sustainable development and enhancing regional resilience.

SHARING SHORELINES: A CANADA–MALAUSIA BEACH-CLEANUP COLLABORATION LINKING COMMUNITY SCIENCE AND EDUCATION ACROSS UNESCO GLOBAL GEOPARKS

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Keywords: environmental education, citizen/community science, international collaboration, marine litter and ocean conservation, youth engagement, SDG 12/14/17

In 2025, Discovery UNESCO Global Geopark (Canada) and Langkawi UNESCO Global Geopark (Malaysia) piloted a practical, replicable program that pairs coordinated beach cleanups with simple shared data protocols to connect students and communities across borders. The initiative aimed to (1) reduce local shoreline litter; (2) generate comparable community-science data; and (3) build intercultural learning between schools and community groups in both geoparks.

Teams conducted cleanups at coastal sites in geoparks during May–August 2025. Using a common field sheet, participants weighed and categorized items (e.g., plastics, metals, fishing gear, cigarette butts) and recorded site conditions.

Beyond debris removal, the project created structured opportunities for student exchange: partner classrooms will compare results, discuss local coastal issues, and reflect on shared solutions. The program strengthened ties between geoparks, municipalities, schools, NGOs, and local businesses, while establishing a baseline dataset that can be repeated annually and expanded to additional sites. Outcomes align with SDG 12 (Responsible Consumption and Production), SDG 14 (Life Below Water), and SDG 17 (Partnerships for the Goals).

This talk will share our simple toolkit (field sheet, training slides, and data summary template), lessons learned for coordinating schools and volunteers, and recommendations for other geoparks seeking a low-cost, high-engagement model that blends hands-on stewardship with international learning.

ADVANCING GEOPARKS IN LATIN AMERICA AND THE CARIBBEAN: REGIONAL SYNERGIES AND PERSISTENT CHALLENGES

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Keywords: UNESCO Global Geoparks, sustainable development, community engagement, heritage conservation, territorial management.

Since the establishment of the regional geoparks network for Latin America and the Caribbean (GeoLAC), there has been notable growth in the inclusion of new territories in the Global Geoparks Network (GGN). Considering that it took 13 years from the creation of the GGN in 2004 for only four territories in the Latin America and the Caribbean to be incorporated, the increase to 15 geoparks within just eight years of GeoLAC's existence represents a significant progress.

While numerous geopark initiatives have been launched in the region since 2004, the formalization of a regional network has proven crucial. With the support of the GGN and UNESCO, GeoLAC has enabled the development of enhanced training and mentorship programs, along with technical guidance for geopark projects development. This support has played a significant role in facilitating a more favorable result in the endeavor to obtain UNESCO Global Geopark (UGGp) designation.

Despite this progress, many initiatives across the region still face substantial challenges in preparing strong applications for GGN membership and obtaining UNESCO Global Geopark (UGGp) status. In response, GeoLAC, working with at least a dozen projects, undertook an assessment to identify key obstacles. This involved the administration of a prospecting questionnaire that included general questions related to the project, in addition to assessing the responses to UNESCO's "Checklist to Define an Aspiring UNESCO Global Geopark (aUGGp)."

Analysis of the collected data revealed that the most significant challenge faced by aspiring geoparks in Latin America is establishing a functional management structure supported by a stable and secure budget. Other commonly cited difficulties include effective engagement with local communities and stakeholders, and ensuring the long-term financial sustainability of infrastructure and materials.

The objective of this study is to present the main challenges identified in GeoLAC members and new initiatives and to promote solutions through enhanced networking and international cooperation. Strengthening the capacity of local teams through targeted training and support will contribute to the development of more robust management structures and stronger candidacies for UGGp designation.

In this regard, strategic alliances for advanced training have been identified as essential, and therefore, GeoLAC works closely with the GGN and the two UNESCO Chairs in Geoparks that currently exist: the UNESCO Chair on "Geoparks, Sustainable Regional Development and Healthy Lifestyles", held in the University of Trás-os-Montes and Alto Douro, Portugal, and the UNESCO Chair on "Geoparks and Sustainable Development of Insular and Coastal Areas" held in the Aegean University, Greece. We are confident that collaboration will help overcome many of the challenges in establishing new geoparks in the region.

BUILDING BRIDGES THROUGH GEOPARKS: REGIONAL AND INTERNATIONAL COLLABORATIONS OF THE JAPANESE GEOPARKS NETWORK

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Keywords: collaborations, sustainable development, capacity building, network

The Japanese Geoparks Network (JGN) has been working in close collaboration with a wide range of organizations that share UNESCO's principles of education, science, and culture, in order to advance and promote geopark activities. These efforts have contributed to enhancing the social significance of geoparks both in Japan and abroad.

At the national level, JGN has cooperated with the Japan Geopark Committee, the Japanese National Commission for UNESCO, the Secretariat of UNESCO Associated Schools, the National Federation of UNESCO Associations in Japan (NFUAJ), the Youth Committee of the Japanese National Commission for UNESCO, as well as nature conservation organizations supporting UNESCO Biosphere Reserves. Beyond UNESCO-related organizations, JGN has also built broad collaborations with various institutions, including the AEON Environmental Foundation, the Japan Riders' Forum, the outdoor brand Montbell, and the National Institution for Youth Education. Through these collaborations, JGN has carried out diverse activities such as nationwide exchanges, promotional initiatives, and outreach programs.

Internationally, JGN has developed collaborations with UNESCO Regional Offices and has supported geopark development in other countries through Official Development Assistance (ODA). A notable example was the training program organized in cooperation with the JICA Kyrgyz Office, which hosted participants from Kyrgyzstan in Japan to strengthen capacity for geopark and sustainable development initiatives in Central Asia.

This presentation will highlight specific examples of these domestic and international collaborations, and discuss how geoparks serve as platforms for putting UNESCO's mission into action while acting as bridges between local communities and the wider world.

ABOUT FUNGI AND BEING IN THE DARK – A CREATIVE COLLABORATION BETWEEN SATUN AND ENGLISH RIVIERA UNESCO GLOBAL GEOPARK

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Keywords: artists, caves, fungi, exchange, exploratory, collaboration

The remit and capacity of UNESCO Global Geoparks to deeply connect communities across continents is increasingly important in these times of global change and challenge; supporting us to live better with uncertainty and 'being in the dark'.

Connecting the Satun UGGp, Thailand and English Riviera UGGp, UK, through the support of the British Council International Collaboration Fund, *About Fungi and Being in the Dark* is a collaborative exchange and creation project that brings together Producers (Chiang Mai Art Conversation, Thailand with Filament Works CIC, UK); Artists (Arnont Nongyao, Thailand; NooN Collective, UK) and wider conservation, educational and cultural partners in both countries. The project takes inspiration from fungi found in karst caves in the two locations to imaginatively explore themes of mycelium connection. The creative enquiry that is central to the project is around how being in the dark and a state of not knowing can open up new imaginative possibilities, strengthen collaborative problem solving, risk-taking and experimentation, and build our shared resilience.
In the UK, NooN are a multi-disciplinary collective bringing together music, movement, costume and generative art to create experiences for audiences to deepen their relationship with the natural world. In Thailand Arnont Nongyao's experimental sound works are located with modes of listening and hearing as collective audiences.

The two localities are connected, both with globally significant cave systems: in Thailand, Satun UNESCO Global Geopark with Le Stegodon and Phu Pha Phet caves; in the UK, the English Riviera UNESCO Global Geopark with Core Partner Kent's Cavern and Neale's Cave (managed by Core Partner Wild Planet Trust) amongst others.
Working with wider conservation partners, academics, local experts and indigenous knowledge, roots the work in the wider ecology of place as well as practically helping with collecting sounds from the karst caves and reaching diverse audiences.
Artist exchanges took place during April-May 2025, with shared experiences at Geopark caves and cultural sites, as well as ongoing connections through a series of real-time and digital labs. Art Residency Thailand based at PREM International School, Chiang Mai, are also supporting project artists and extending opportunities for public engagement.
The project will culminate in contemporary installation and immersive performance works for public audiences, in cultural venues and cave spaces in August & October 2025. A digital concept album and online lab space will also share work with online audiences Filament is an Associate Partner of the English Riviera UNESCO Global Geopark and this collaboration provides a unique opportunity for us to catalyse and support cultural exchange between artists and organisations in the UK, Thailand and our two Global Geoparks.
It is hoped this will be the first of many further collaborative opportunities – if you are from a UGGp interested in working with us in the future please get in touch.

REUNITE PANGEA: BUILDING TRANSATLANTIC BRIDGES THROUGH SHARED DEEP-TIME HERITAGE

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Keywords: geoparks, paleogeography, community engagement, geoheritage, transatlantic collaboration

‘Reunite Pangea’ is a growing transatlantic partnership between the Algarvensis Aspiring UNESCO Global Geopark, Portugal (aUGGp) and the Cliffs of Fundy UNESCO Global Geopark (Canada), designed to connect territories that were geologically united more than 200 million years ago during the time of the supercontinent of Pangea. Through science, culture, education and community involvement, the project reimagines this ancient link for present and future generations. The initiative stems from a shared paleontological and geological record, including similar trace and vertebrate fossils, like Metoposaurus, and lava flows of the CAMP (Central Atlantic Magmatic Province). Long-studied and accepted seafloor and geophysical data shows that both regions were once closely adjacent. This scientific foundation supports a broader strategy for collaborative storytelling and education through mirrored geosites, community events, and digital interpretation tools. A cornerstone of this collaboration is the integration of community-based art and science, inspired by successful territorial practices that serve as prototypes for future joint activities. Examples include the Algarvensis Geopark project GeoPalcos - Art.Science.Nature and the Parrsboro International Plein Air Festival – PIPAF, held in the Cliffs of Fundy. These locally rooted experiences represent living laboratories for testing formats that may be adapted and replicated transnationally under the Reunite Pangea vision. In its first edition (2021), GeoPalcos brought over 3,000 participants to 10 geosites, blending music, exhibitions, hikes, and performances to create a dialogue between tradition and innovation. The second edition (2023) shifted the focus to community-led planning, engaging artists, residents, and people with special needs. Events like the “Children’s March of Penina” became powerful symbols of local ownership and creative re interpretation of geological heritage, especially the Metoposaurus fossil, transformed into the “Giant Salamander of Penina” through music, costumes, and performance. This model, involving schools, families and visitors, also engages with pressing governance issues. In Algarvensis Geopark, most geosites are located on private land, requiring ongoing awareness, capacity building, and advocacy

efforts with landowners and authorities. These efforts are central to the Geopark's strategy for long-term conservation and community empowerment, offering a valuable framework for international application. In June 2025, PIPAF held its ninth annual and most successful plein air painting festival within the Cliffs of Fundy Global Geopark region. The festival included 30 juried artists who visited the region to paint for five days. At the final Gala event, over $75,000 of artwork was displayed and prizes awarded in multiple categories. An article was also published in Plein Air magazine. For nine years, PIPAF has brought international artists into the Cliffs of Fundy to appreciate the geology of the coastal communities, the world's highest tides, and learn about Mi'kmaw culture. PIPAF attracts professional artists from across Canada and the United States and has aspirations to draw from the professional community in Europe. Through ongoing discussions, the two geopark territories are planning the Pangea Trail, with interpretative signage in both territories; plein-air artistic residencies and fossil-inspired exhibitions; educational exchanges between Portuguese and Canadian students and young researchers; digital and immersive storytelling tools; and joint communication initiatives highlighting their shared geological history. 'Reunite Pangea' advances multiple themes of the UNESCO Global Geoparks Network – education, science, climate awareness, sustainable tourism, international collaboration, and tangible/intangible heritage – by showcasing how science-driven cooperation can foster artistic expression, territorial cohesion, and community resilience. Ultimately, the project reconnects more than continents: it brings together people, identities, and ideas in a shared celebration of Earth's deep-time narrative.



GEOPARKS, TANGIBLE AND INTANGIBLE CULTURAL HERITAGE, INDIGENOUS COMMUNITIES



RECOVERING DRY STONE HUTS AND SHEPHERDS' SHELTERS IN LAS LORAS UGGP

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Keywords: intangible heritage, dry stone, networking, community

The territory of Las Loras UNESCO Global Geopark (Burgos-Palencia, Spain) has been used for agriculture and livestock farming since Neolithic times, as evidenced by the various stone structures and constructions found there. Dotted throughout the highlands of Las Loras, but also in its fertile valleys, numerous huts and shepherds' shelters built of dry stone are still preserved today. The wide variety of shapes depending on the area, as well as the different names given to these buildings, represent a rich intangible heritage that we must protect. In addition, the people who maintained them are now elderly or in some cases no longer with us, and although the younger generations are aware of the importance of this heritage, in many cases they have not inherited the knowledge of how to build these structures. Four years ago, we began researching the Geopark and a couple of years ago we made an inventory of the main buildings and their state of conservation. Thanks to funding from a Tourism sustainability Plan (Next generation founds), we have been able to carry out several actions to enhance and conserve them. However, we did not want to do it alone, so we invited other geoparks with experience in this field to join us. Networking allows for this exchange of knowledge, which is why we have been able to share with colleagues and professionals from the Sobrarbe Geopark, the Subbética Cordobesa Geopark and the French Causses du Quercy Geopark. We divided the project into two parts: on the one hand, theoretical and practical workshops for the local community, choosing three areas with very different types of construction; and on the other hand, the reconstruction with professional teams of three elements that were very deteriorated but of great ethnographic importance. The results of the first part have brought together a group of people of different ages who, interested in this technique, want to continue training and working on the reconstruction of different buildings in the Geopark. It has also generated a network that will enable different Geoparks to continue working together and add more in the future. Finally, the elderly people from the different villages who were unable to participate in the work due to their circumstances but also other people from Las Loras villages have felt happy, grateful and proud of the maintenance of their heritage.

GENESTREAM JOURNEYS, ABORIGINAL CONNECTIONS AND GEOPARKS IN WESTERN AUSTRALIA

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Keywords: geoparks, tangible and intangible cultural heritage, aboriginal, indigenous communities

Western Australia has become the launching place for the exciting Genestream Journey sculpture trail across the southwest.

Developed in partnership with Aboriginal Traditional Owner Aunty Carol Petterson and digital designer Ben Beeton, assisted in natural artwork by renowned nature artist Mali Moir, a unique sculpture was designed to represent Deep Time, Earth, landscape, animals and plants and Aboriginal interpretation of each.

After many months of trial and retrial, a design was realized from an upturned coffee table. Yes, an upturned coffee table.

The design now incorporates a ramp of time, an inner circular platform showing time of development of local region animals and plants with panels rising from the platform depicting examples of each on the inner side of the panels and Aboriginal interpretive artwork on the outer side of the panels. Each sculpture is unique to the region in which it is located.

This presentation will outline the process, the significant community engagement and the launch of the Genestream Journeys sculpture trail in Western Australia and its connection to Country for Aboriginal people, and its connection to geoparks.

Geoparks WA was incorporated during my PhD research to encourage, promote and support the establishment of geoparks in Western Australia.

GEOSPATIAL TECHNOLOGIES AND INDIGENOUS KNOWLEDGE FOR TERRITORIAL RESILIENCE: STRENGTHENING IDENTITY IN THE KICHWA SALASAKA COMMUNITY, TUNGURAHUA VOLCANO UNESCO GLOBAL GEOPARK

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Keywords: geospatial mapping, indigenous knowledge, intangible heritage, community resilience, UNESCO Global Geopark

The Kichwa Salasaka people, located within the territory of the Tungurahua Volcano UNESCO Global Geopark (Ecuador), are currently experiencing significant population loss due to internal migration dynamics, a situation that threatens the continuity and intergenerational transmission of their intangible heritage. In this context, and aligned with the objectives of the project Strengthening the Connection between Community, Culture and Geological Heritage, a pilot initiative was implemented to reinforce local identity through the integration of traditional knowledge, geological science, and geospatial technologies. As a main outcome, the community is co-creating a digital repository using ArcGIS StoryMaps, which documents sacred sites, cultural practices, and community narratives linked to the spiritual mountain "Kinlli-Urku" and its surrounding volcanic landscape.

This initiative centers on Kinlli-Urku, a site of spiritual significance for the Salasaka people. From this mountain, a cultural route has been defined, connecting key elements of the sacred landscape—such as the family temples Mama Kinlli, Tayta Kinlli, and Wawa Kinlli—with nearby volcanoes that form part of the geopark's identity, including Tungurahua, Teligote, Chimborazo, and El Altar. The route offers both locals and visitors an experiential model where scientific understanding of volcanic processes is intertwined with the symbolic depth of Andean intangible heritage.

To achieve this, a participatory methodology was applied in three stages. The first stage involved community workshops focused on explaining geological processes, such as subduction and volcanism in the Ecuadorian arc, using accessible and culturally relevant language. In the second stage, women from the Salasaka community reinterpreted the volcanic landscape through the Andean worldview, establishing symbolic links with mountains considered Apus—protective spirits—thus reinforcing the perception of territory as a living and dynamic entity. Finally, the third stage incorporated geospatial tools such as ArcGIS StoryMaps to collaboratively build a bilingual (Kichwa-Spanish) multimedia platform that systematizes and shares the community's sacred routes and heritage practices.

Overall, this pilot initative contributes directly to Sustainable Development Goals 4.7, 8.9, 11.4, and 12.b, promotes women's empowerment, and opens sustainable economic opportunities grounded in cultural identity. It also offers a replicable model for other geoparks facing similar challenges, demonstrating the value of integrating science, Indigenous worldviews, and digital mapping as tools for territorial resilience and sustainable development.

SDG 18 "UNITED VOICES (AHOTS BATUAK)": A GLOBAL PARTNERSHIP TO PROTECT CULTURAL AND LINGUISTIC DIVERSITY

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Keywords: UNESCO collaboration, Sustainable Development Goals, intangible cultural heritage, language diversity

This objective seeks to claim and guarantee the presence and recognition of all languages and cultures in the Agenda 2030 for the development of people and societies. Currently, culture is mentioned indirectly, and languages are not even mentioned. The agenda, therefore, remains incomplete without mentioning cultural and linguistic diversity, which is a fundamental pillar if we consider that language permeates each and every one of the objectives, and even more so when we talk about minority languages.

Doctrine and experience have shown us that languages are an economic engine, a key factor for peace and social cohesion and, definitely a human rights issue. For all these reasons, sustainable development must necessarily take languages into account.

For several years, researchers have proposed studying biological, linguistic, and cultural diversity together due to their close relationship. This is why UNESCO introduced the term "biocultural diversity". The rate at which species and languages are disappearing has accelerated since the beginning of the 20th century. This is where biodiversity and linguistic diversity converge. 70% of existing languages are spoken in the most biodiverse areas of the planet: 4,800 of the 6,900 spoken worldwide. In Latin America, 80% of natural areas are inhabited by indigenous peoples.

We know that the places most affected by poverty and the effects of climate change in the world are culturally and linguistically diverse. The knowledge generated and accumulated over centuries by local communities, which allows them to interact with each other and with their surrounding environment, is being lost forever.

Talking about protecting biodiversity and linguistic diversity becomes talking about defending the territory and environmental defenders; about access to justice, training, and the creation of policies that truly integrate and consider the complexity of diverse life systems.

If, as the Agenda states, poverty is the most serious problem we face, we cannot adequately address it if we do not take into account the specificities of local languages and cultures. In the field of education, if we aim to achieve inclusive education, it will be necessary to promote models that encourage the use of one's own language and culture.

For all the reasons mentioned above, we believe the Geoparks Network can be an appropriate environment for working on the appropriation, enhancement, and promotion of linguistic diversity. The States are represented at UNESCO, but we must go a step down to work this issue with the population itself and the administrations closest to them; as they are not always a priority for States.

RAISING AWARENESS ON THE DRY-STONE CONSTRUCTIONS OF PSILORITIS UGGP, CRETE, GREECE

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Keywords: mitata, dry-stone, intangible heritage, Psiloritis

Psiloritis UGGp in Greece is dominated by carbonate rocks and strongly influenced by tectonic and karstic processes. The territory is characterized by its rich biodiversity with lots of endemic species, while the cultural heritage of Psiloritis UGGp, both tangible and intangible, are undeniable and form the unique local identity of the residents of the area. Some of the most emblematic structures of the cultural heritage of Psiloritis UGGp are the mitata. The mitata are round, dry-stone constructions made to serve as shelters for the shepherds against the harsh conditions they faced in the mountains. The mitata, along with other dry-stone constructions -like terraces, plowing fields, fences etc.- were an important aspect of the pastoral/agricultural way of life. Made using the local platy marbles, these constructions are a testimony to how the limited resources and raw materials of Psiloritis were able to sustain the local communities of the past, thus highlighting the strong connection of geology and culture under the scope of sustainability. As such, Psiloritis UGGp with its partner "Androidus-Argastiri Cultural Organisation", implemented under the CLLD/ LEADER program and the co-finance by Greek and EU funds, a series of actions to promote and also preserve the valuable practice of dry-stone construction that is, unfortunately, in decline because of the modern way of life and the decrease of craftsmen able to preserve this traditional technique inscribed in the UNESCO Intangible Cultural Heritage Lists.

The actions included: (1) the scientific documentation and classification of the dry-stone constructions of Psiloritis with particular emphasis on the mitata; (2) the organization of an international 3-day scientific conference where the timeless importance of dry-stone constructions were highlighted as cultural and functional elements for Psiloritis and other regions of Greece struggling to keep their cultural tradition alive, calling the local communities to recognize, transmit and develop the knowledge of its ancestors; (3) design and production of thematic promotional brochures addressing the key topics of: (a) mitata as a primary habitation and management hub of the mountainous area, (b) the integration of the mitata into the Psiloritis landscape, (c) the ecological values and social symbolism of the mitata, (d) the contribution to sustainable development and (e) potential for reuse in the modern reality; (4) the organization of thematic evenings in different villages of the UGGp related to the cultural, environmental and social dimension of dry stone constructions; (5) the creation and installation of an experiential education space functioning as an active learning and transmission laboratory of the art of dry-stone created in situ (up the mountain) in collaboration with a local specialized dry stone craftsman; and (6) a mobile exhibition with the possibility of moving it across and beyond Psiloritis UGGp.

AGROBIODIVERSITY LINKING NATURAL AND CULTURAL HERITAGE IN THE MIXTECA ALTA UNESCO GLOBAL GEOPARK

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Keywords: Research in Geoparks, cultural heritage, conservation, Local Sustainable Development, traditional knowledge

Mixteca Alta UNESCO Global Geopark (MAUGG) is in southern Mexico in the estate of Oaxaca. With an extension of 415 km^2 is characterized by rich geodiversity and high biodiversity expressed by seven vegetation types. The climate is temperate with summer rain and cold and dry winter. Agriculture is also divers, and it includes traditional agriculture systems some of them are very old and agricultural systems with modern and high technology.

Agrobiodiversity is also referred to as the diversity of living organisms on agricultural lands and their surrounding areas. Most of the time researchers pay more attention to domesticated plants and wild plants growing in the parcel or in the adjacent wild areas. In this oral presentation I will first show the connection between wild and cultivated plants with the environment, to argue that this biodiversity is part of the natural heritage of the zone. Secondly, I will present the interaction of biodiversity with the varied agricultural landscapes on the MAUGG. Agricultural landscapes are the result of traditional knowledge about environment, land management, agricultural techniques and technology. Soil, geology, landforms, and water access are the main environmental characteristics that determine the type of agricultural landscape. Some agricultural landscapes in MAUGG are very ancient such as lama-bordo terraces and some crop varieties also are very old. In this way, agrobiodiversity is the consequence of environmental y biological (natural) elements interacting with local knowledge and agricultural technology. Moreover, this agrobiodiversity is the main source for food local ingredients. So that, edible plant diversity is the base of traditional local cuisine and at the same time the food is one of the unique elements of cultural heritage. In 2010 Mexican cuisine was declared as intangible cultural heritage of humanity by UNESCO.

We have found 180 edible plants with are both cultivated and wild. This large set of plant ensures food availability all year around. And they are the base for several traditional dishes that give varied food for each season. Also, local food production in traditional agroecosystems is an important pilar for food security, for example, during the Covid pandemic between 2020 and 2022, local agricultural production and wild plants and animals were very important as source of food due to disruption of market food supply.

A TALE OF A WHITE BEACH - INTERWOVEN HERITAGES IN SHIRAHAMA SHRINE, IZU PENINSULA UGGP, JAPAN

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Keywords: intangible cultural heritage, ecological heritage, submarine volcano category, tangible and intangible cultural heritage

Located on the Southeastern Tip of the Izu Peninsula, Shirahama Shrine has been a renowned place of worship among the local community. The history of the shrine vividly illustrates interrelationships between geological, ecological, and cultural heritage aspects.

The geology of the locale plays an essential role in the origin of the shrine. The main pavilion, which is dedicated to the deity, is located at the top of a low hill. The shrine sanctuary includes a white sandy beach and a small volcanic archipelago that can be observed on the opposite shore. The hill was formed from differential erosion, and archaeological investigations have revealed that it has been used as a place of worship since prehistoric times. A recent survey of historical documents showed that the origins of the existing 'modern' shrines can be traced back to two major eruptions that occurred on the volcanic islands opposite the shrine in the 9th century. According to the document, the Imperial Court at that time decided to perform a magnificent ritual on the white beach to relieve the deity of the volcanoes on the opposite shore. This has been an annual ritual since then. The vantage points for observing the offshore volcanism, triggered by a historical eruption, became a center of worship with the intervention of the central government.

The shrine sanctuary is also known as one of the last remaining primeval forests on the peninsula. Similar to the rest of Japan, local communities in the region have shunned the development of forests within the sanctuary. Amid the tourism boom in the early 20th century, the sanctuary remained untouched and is now known as the northern boundary of the population of Chinese Parasol trees (*Firmiana simplex*). The religious importance of the shrine unintentionally underpins regional biodiversity.

With a much longer timeframe than that used by conventional historians, the Izu Peninsula UGGP aims to shed new light on local history. In the modern world, geoparks can serve as minstrels, telling dramatic sagas interwoven with the interaction between the Earth and its inhabitants.

IZU STONE -A HERITAGE STONE THAT BUILT THE CAPITAL OF JAPAN-

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Keywords: natural stone, volcanic rock, tangible cultural heritage, human history

Izu Stone (*Izu-ishi*) is a historically and culturally important natural stone from Izu Peninsula, central Japan. It is known for its significant role in the development of Tokyo Metropolitan Area (formerly Edo) and other major architectural projects. It is a candidate for designation as a Heritage Stone by the International Union of Geological Sciences (IUGS), which honors stones that have had a notable impact on human history and culture.

The Izu Peninsula is located at a plate boundary, resulting in a variety of volcanic rocks. Izu Stone is generally classified into soft stones (mainly tuff, derived from submarine volcanic activity) and hard stones (such as andesite and basalt, formed by terrestrial volcano and intrusion). The stones vary in color, texture, and physical property, and are highly fire-resistant, making them suitable for various architectural uses.

The use of Izu Stone dates back to the 8th century, but it became especially important during the Edo period (17th-19th century), when the Tokugawa shogunate used it extensively to construct Edo Castle, roads, and waterworks. The geology around Tokyo mainly consists of sedimentary rocks originating from accretionary complexes. With limited local building stone available near the capital, Izu Stone was transported by sea and became an essential material in the rapid development of Edo into one of the world's largest cities. Izu Stone also played roles in diplomacy and national defense during the late Edo period. It was used in coastal fortifications and even presented to Commodore Perry during Japan's opening to the West.

In the Meiji era (19th-20th century), the stone continued to played an important role in Tokyo modernization. Modern quarrying techniques introduced by foreign engineers, it was used in Western-style buildings such as the Bank of Japan and Tokyo Resurrection Cathedral. The Great Kanto Earthquake of 1923 meant that the city of Tokyo had to be drastically remodeled from Izu Stone architecture built in the early Meiji period, but Tokyo's urban infrastructure shaped by Izu Stones continues to influence Tokyo's urban development today.

Today, Izu Stone remains a symbol of Japan's geological, historical, and cultural heritage. Ongoing conservation and educational efforts, including Geopark activities, aim to preserve this legacy and highlight its enduring importance.

THE HISTORY OF COPPER IN CYPRUS

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Keywords: copper, sulphide deposits, Troodos, Cyprus

The Troodos mountain range was created along a sea-floor spreading axis by ascending magma from the Earth's Upper Mantle to the bottom of the Neotethys ocean and was subsequently gradually uplifted to its present position at the central part of the island, as a result of the convergence between Eurasia with the African and Arabian plates.

Diverse mineral-rich rocks compose the most significant piece of oceanic crust on Earth, which play a key role for the development of the divergent boundary theory and the formation of new oceanic crust as we know it today.

The Troodos foothills are dominated by volcanic rocks, within which are scattered rich copper sulphide deposits that were intensively exploited in antiquity for the production and trade of copper, where Cyprus became synonymous with it, forming the island's economy, prosperity and culture.

Its copper history began during the Chalcolithic period, where the ancient Cypriots initially discovered and exploited native copper for the creation of jewelry and tools. From 1800 B.C. and onwards Cypriots began to use fire in smelting furnace installations to produce large amounts of metallic copper. This resulted in the development of the first major urban centers at the beginning of the Late Bronze Age, some of which became important trading seaports, from where copper ingots were exported to the Egyptians, the Hittites, the Minoans, the Mycenaeans etc.

Cypriot copper ingots identified in Crete (1450 B.C.) and Sardinia (11th century B.C.), as well as from ancient shipwrecks at south-west Turkey, such as that of Uluburun (1300 B.C.), are a testament of the large amounts of copper that were exported all over the Mediterranean and beyond. Furthermore, the eight letters of Amarna between a king of Alasia (Cyprus) and an Egyptian pharaoh mention the shipment of a total of 897 copper ingots, while wall-paintings depict men carrying copper ingots as gifts to the pharaoh.

During the Roman period, Cyprus was so important for the production of copper that the ancient writer Pliny the Elder, mentions that copper was discovered in Cyprus. Furthermore, copper salts from the mines of Cyprus had an important contribution to pharmacology and medicine. References in ancient literature to the minerals of Cyprus and their use in the manufacture of medicines were written by Galen, Dioscorides and Strabo.
The mining activity ceased in the 7th century AD due to the continuous Arab raids and resumed in the early 20th century with the export of copper concentrate and copper cement as well as pyrite, while metallic copper was produced and exported for the first time since antiquity in 1996.

Today, the depletion of the existing surface deposits has led to a quagmire of the mining activity in Cyprus and the discovery of new copper deposits is imperative to continue its longstanding mining history.

EARTH EVOLUTION AND HUMAN-EARTH HARMONY : THE "UNITY OF HEAVEN AND HUMANITY" PATHWAY ON GEO-CULTURAL HERITAGE CONSERVATION IN KANBULA GLOBAL GEOPARK

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Keywords: Kanbula, climate change, geo-hazards, geo-cultural heritage conservation

Kanbula UNESCO Global Geopark (approved in April 2025) is situated at the northeastern margin of the Qinghai-Xizang Plateau in Qinghai Province, China. Located within China's physiographic-step transition zone, the Geopark systematically preserves a 250-million-year geological record of the plateau's northeastern margin evolution. Its Triassic deep-sea sedimentary strata in the Longwu River are acclaimed as "the most complete record of ocean-continent transition" in the Paleo-Tethys Ocean. The rare coexistence of the Longwuxia ultramafic rock body, submarine-to-terrestrial volcanic transitions, Danxia landforms, and Yellow River landscapes, establishes the Geopark as a natural museum for studying tectonic evolution, giant landslides along the upper Yellow River, and climate change.

Kanbla UNESCO Global Geopark exhibits distinctive environmental evolution characterized by Neogene strata formed during the plateau uplift, sculpted by the Yellow River and its tributaries into the world-renowned "turquoise waters against crimson cliffs" landscape. Functioning as a critical plateau ecological barrier, the Geopark harbors rich biodiversity (>800 plant species, 90+ wildlife species including rare animals like *Gervus albirostris* and *Pantholops hodgsonii*). However, accelerated surface erosion induced by periglacial weathering compounded by climate warming has escalated ecological degradation risks in fragile geological settings.

Kanbula UNESCO Global Geopark demonstrates its core value through "Unity of Heaven and Humanity" geo-cultural practices, pioneering a "Geology-Ecology-Humanities" co-conservation model: Regong Art transforms local rocks/minerals into Thangka pigments, while cultural bards orally transmit geological narratives; Pastoralists transition into eco-stewards, integrating indigenous knowledge with modern technology for landslide monitoring and grassland conservation; Innovative geo-education via school programs, field studies, and UNESCO-listed ICH resources (Regong Art, Zang Opera) redefines the Geopark pedagogy.

Confronting challenges, the Geopark employs "Integrated Sky-Ground-Space Monitoring" to synergize ecotourism with cultural preservation. This establishes a Chinese paradigm for sustainable high-altitude geopark governance, offering an exemplar for deciphering Earth's evolution and achieving human-terrestrial harmony.

EXPLORING THE INTANGIBLE CULTURAL HERITAGE THROUGH DIGITAL MEDIA ART: THE "MÃE SOBERANA" CASE IN THE ALGARVENSIS AUGGP, PORTUGAL

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Keywords: Algarvensis Geopark, digital media art, intangible cultural heritage, community engagement, heritage communication

The convergence between digital media art and intangible cultural heritage (ICH) offers new ways of interpreting and communicating community identity within Geoparks. In the context of the Algarvensis aspiring UNESCO Global Geopark (aUGGp), this case study explores an innovative approach based on the Mãe Soberana tradition, a deeply rooted cultural-religious manifestation in the municipality of Loulé, classified as ICH since 2015. The Mãe Soberana ritual gathers social practices, festive events, and shared symbolic memory, constituting a living expression of the community's relationship with the territory. The project proposes the integration of digital media tools, including augmented reality, transmedia storytelling, QR code-triggered experiences, and the Artivive app, enabling an immersive and participatory interaction with this intangible heritage. Through these tools, visitors and inhabitants are invited to activate layered narratives, transforming the visit into a dialogue with space, memory, and culture. Rainwater, a central symbolic element in the origins of the cult, is interpreted as a connector between the past and the present, the tangible and the intangible, the spiritual and the ecological. This metaphor resonates strongly with today's climate crisis, still present in the Algarve region, and offers a unique opportunity to discuss sustainability, memory, and resilience in the context of the Geopark's mission. The project aligns with the aUGGp's strategy to reinforce cohesion across its territory by promoting community-based and technologically enhanced communication tools. It supports the Geopark's educational, scientific, and cultural objectives by offering a replicable model that can be applied in other geosites and cultural nodes within the 2,428 km² territory, particularly those associated with local traditions, symbolic landscapes, or spiritual heritage. This initiative also addresses one of the challenges faced by the aUGGp: ensuring that the Geopark is perceived as a unified territory, and not merely as three municipalities working independently. The Mãe Soberana case, while based in Loulé, is designed as a pilot that symbolically and methodologically connects communities, promoting a shared narrative framework and creative interpretation formats across the Algarvensis territory. By involving local actors and integrating new technologies into heritage communication, the project promotes intergenerational engagement and enhances the Geopark's mission of safeguarding, interpreting, and celebrating both its geological and cultural heritage. It contributes to reducing seasonality, attracting younger audiences, and innovating in the way Geoparks engage with their communities. In summary, the Mãe Soberana digital art case is not only a tribute to a living tradition, but also a strategic and transferable tool to reinforce territorial identity, public participation, and innovation in the Algarvensis Geopark.

ECHOES OF AN ISLAMIC LEGACY IN THE ALGARVENSIS GEOPARK LANDSCAPE: HISTORY, IDENTITY, AND INTERPRETATION

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Keywords: Islamic heritage, Algarvensis Geopark, cultural identity, geotourism, landscape interpretation

The Algarvensis territory has witnessed millennia of human presence, but one particular period - spanning approximately five centuries -left an especially profound and multifaceted imprint. In the early 8th century, peoples of diverse origins, united under the Islamic faith, arrived in the region, motivated by spiritual, economic, and territorial ambitions. These communities introduced advanced water management systems derived from a blend of Eastern traditions. Their techniques enabled new forms of land cultivation and the introduction of fruit and plant species that reshaped the landscape and enriched local gastronomy. To control this strategically important territory, new urban and rural settlement models emerged. Cities and villages were established or reconfigured to adapt to the needs of the time. Amid the turbulence of ongoing territorial disputes, sophisticated defensive systems were developed - from fortified city cores to remote hilltop strongholds. Today, these remnants remain etched across the Algarvensis Geopark landscape. Vestiges of this golden period are still visible in structures such as the Loulé Baths, the Silves cistern well, and the remains of major mosques in both towns. These sites have been preserved and made accessible, allowing residents and visitors to encounter the tangible layers of the Islamic past. Everyday artefacts, uncovered through archaeological excavations and scientific analyses, are displayed in the museums of Albufeira, Loulé, and Silves, where educational programmes continue to transmit the cultural legacy of this era. This heritage also endures in intangible forms - in the Portuguese language, where countless Arabic-rooted words persist, and in the physical features and traditions of local populations. The Muslim legacy of the Algarvensis territory is thus not only a historical reality but a living dimension of its identity. It provides unique cultural markers without direct national parallels, strengthening the distinctiveness and authenticity of the region. In the framework of the Algarvensis aspiring UNESCO Global Geopark, this heritage is not merely preserved - it is actively integrated into educational, interpretative, and cultural programmes that promote intercultural dialogue, inclusion, and territorial identity. By highlighting the Islamic legacy as a foundational narrative of its landscape and communities, the Geopark reinforces its role as a platform for valuing cultural diversity, historical depth, and shared memory. Through its thematic routes, the Geopark offers visitors immersive experiences that demonstrate how geology and culture are deeply intertwined. Interpretative stops at key sites -such as the Loulé Baths and Silves fortress - invite reflection on how natural features and human history shaped one another. This approach helps communicate how the landscape continues to tell the story of centuries of Muslim presence, making visible the connections between geological formations, settlement patterns, traditions, and memory.

THE LAND OF EXTINCT VOLCANOES UNESCO GLOBAL GEOPARK - THE LAND OF PEOPLE FROM SOMEWHERE

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Keywords: intangible cultural heritage, history of the region

The Kaczawskie Mountains and Foothills, where the Geopark is located, are part of a large region called Lower Silesia. Lower Silesia does not have a traditional costume, folk music, dialect/language, or characteristic dishes and customs. The region's identity is still being formed.

This situation stems from the history of the region. The Polish part of the history of these areas ended as early as the 13th century. Over the following centuries, the area was under the influence of Bohemia, Prussia, Austria and Germany. Even after Poland regained its independence in 1911, the area remained within the borders of Germany.

As a result of agreements after World War II, Poland lost land in the east and gained land in the west. The border changes caused large population migrations. Today, the Geopark and the whole of Lower Silesia are home to people from very different areas, including the lost lands in the east: from the territories of present-day Lithuania, Belarus and Ukraine. The resettlement process was extremely chaotic, and even if there was a plan to move all the inhabitants of one village together, it was rarely successful. In the early post-war years, there was also a military settlement process– soldiers from various units and places were assigned to live here as they were unable to return to their destroyed homes. In recent years, there has been a significant migration of people from large cities throughout Poland.

Until 1989, virtually no ethnographic research was conducted, and most of the documentation related to resettlements is still located in Ukraine and Belarus. In communist Poland, this was a taboo subject. It is only in recent years that public debate and scientific research on this topic has begun.

It is difficult for us to identify what constitutes our intangible cultural heritage. We hope that the existence of the UNESCO Global Geopark will help us not only to witness the creation of a new cultural identity, but also to actively participate in this process.

HERITAGE AND DEVELOPMENT OF HUIZHOU GASTRONOMY IN HUANGSHAN UNESCO GLOBAL GEOPARK

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Huangshan UNESCO Global Geopark is located in the heart of ancient Huizhou, China. Blessed with breathtaking landscapes and a rich cultural heritage, the region is also the cradle of Huizhou cuisine,—one of China's Eight Great Culinary Traditions,—whose cooking techniques are recognized as a National Intangible Cultural Heritage. Originating from the Huangshan and Xin'an River region, Huizhou cuisine is deeply rooted in the local environment, climate, produce, and folk customs, forming a unique style that values authenticity, simplicity, and rich, mellow flavors.

The savory aroma of stinky mandarin fish, the steaming warmth of Yipinguo (assorted hotpot), and the deep fragrance of Daobanxiang (aromatic pork) are more than just dishes.—They are taste memories passed down through generations, carrying the spirit of Huizhou merchants, family traditions, and the essence of regional culture. Huizhou cuisine is not only a feast for the table but also a "delicious history book," telling the story of the Huizhou people's harmony with nature, diligence, and wisdom.

While preserving its traditions, Huizhou cuisine actively embraces modern trends through creative dishes, the development of culinary brands, and integration with tourism and cultural events, spreading its influence across China and beyond. Today, Huizhou cuisine is taking on a more open and inclusive character, becoming an important cultural ambassador that showcases both Chinese culinary heritage and the charm of Huizhou to the world.

ADHERING TO THE 800-YEAR-OLD TRADITION OF HUMAN-CARPS COEXISTENCE - LIYUXI OF NINGDE UGGP

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Keywords: intangible cultural heritage, human-carps coexistence

Liyuxi is one the core scenic areas of Ningde UGGp. It is an ecological and cultural model of harmonious coexistence between human and nature, with its unique "human-fish symbiosis" tradition lasting over 800 years. This ancient village, listed as a Fujian Provincial Intangible Cultural Heritage, showcases a legendary ecological wisdom transcending time and space.

The story began during the Jiading era of the Southern Song Dynasty (1209 AD), when the Zheng clan ancestors settled in Puyuan Village and innovatively released carps into the stream to purify water. During the Yuan-Ming transition period, facing famine threats, the eighth-generation of Zheng clan established strict clan rules to protect the carps- even enforcing them through his own grandson's punishment, ultimately forging the sacred covenant: "No fish means no village". This tradition has endured for centuries, evolving into a comprehensive carps conservation cultural system.

For centuries, villagers have developed unique carps burial rituals: constructing tombs for deceased carps, composing memorial texts, and holding grand carps funeral ceremonies annually on the third day of the third lunar month. Regarding ecological wisdom, villagers innovatively built L-shaped underwater fish passages, planted calamus and other aquatic plants, and arranged pebble "flow weirs" to enhance breeding environments for carps. These measures have made Liyuxi a globally unparalleled ecological marvel.

Facing modernization challenges, the local community has implemented innovative conservation measures: establishing a Cultural Research Institute and Management Committee to formulate protection development plans; incorporating carps culture into school curricula, with the textbook "The Marvelous Liyuxi" being adopted by Beijing elementary schools; founding a Folk Protection Association to revive traditional carp worship ceremonies and carp-protection martial arts; developing cultural creative products and promoting ecotourism to engage younger generations in cultural preservation.

The story of Liyuxi offers profound enlightenment: sustainable development requires genuine ecological reverence; traditional culture can become a wellspring of innovation; humans and nature should form a community of shared destiny. As witnessed by the weathered carps tomb stele: respect for life ultimately transforms into the depth of civilization. Today, this village continues narrating an eternal tale of life and guardianship through its leaping carps and ancient pebbles, providing invaluable insights for modern ecological civilization construction.

GEOPARK GUARDIANS: A GEOCULTURAL NETWORK FOR PARTICIPATORY HERITAGE MANAGEMENT IN THE COMARCA MINERA (MINING REGION), MEXICO

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Keywords: geopark guardians, community participation, SDGs, biocultural heritage

The Guardians of the Geopark program was created as a community strategy within the UNESCO Global Geopark Comarca Minera, aiming to strengthen the Geopark's presence across each of the nine municipalities that make up the territory, home to 628,746 people, and to promote care and protection of heritage, while fostering sustainable development.
To establish the Guardians groups, the Geopark issued a call for residents in each municipality. Following an informational meeting, they decided to take an active role in the territory as custodians of the heritage and to prepare themselves through a workshop course on geological, mining, natural, and cultural heritage. Among the guardians are artisans, traditional cooks, nature guides, agricultural producers, carpenters, educators, local officials, small business owners, and processors of regional products such as honey, jams, wines, and cheeses. This diversity allows the program to have a broad foundation of knowledge and action, deeply rooted in the environment and cultural practices of each community.

After their training, the Guardians actively participate in the research, safeguarding, protection, and promotion of the geological, natural, and cultural heritage, with a sustainable and biocultural approach. They attend community meetings, provide training, raise awareness, and promote the values of the Geopark in schools at different educational levels. They also represent and promote the Geopark's philosophy at local festivals. In Geoeducation, they design creative and educational workshops using simple language for children, focusing on conservation, protection, and care for the environment and the heritage. Through this program, the territory meets some of the Sustainable Development Goals (SDGs), such as: Quality Education, Good Health and Well-being, Gender Equality, Decent Work and Economic Growth, Reduced Inequalities, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action, and Partnerships for the Goals.

To promote multidisciplinary research, the "Permanent Virtual Seminar: Geopark Guardians" was established, held every Tuesday at 8:00 p.m., and broadcast live on Facebook via the geopark's page.

A year and a half after its creation, the program is growing stronger as a network of shared commitment, care, and collective knowledge. The Geopark Guardians are representatives of the local population and embody active community participation. They recognize and activate traditional knowledge and local practices, engaging in dialogue with science to build a sustainable present and future. They help strengthen territorial identity and forge links between the Geopark and its people, generating deep transformations in the sustainable enjoyment of their land, managing from the bottom up and from the local to the global.

"WEAVING HOPE": TEXTILES AS A MEDIUM AND SUPPORT FOR MULTICULTURAL REINTERPRETATIONS

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Keywords: textile work, handicrafts, cultural heritage, indigenous communities

The following reflections arise from the challenge of designing a textile installation consisting of fiber canvases from 28 countries and 52 UNESCO geoparks. This work, called "Weaving Hope," will be located in the city of Temuco, host of the 11th UNESCO Global Geoparks Conference, and aims to bring together the material and symbolic representations of those multicultural interpretations of what is a traditional textile representative of each territory.

The Weaving Hope project is conceptually built on a dual purpose that sets it apart from a simple exhibition. The first objective is to showcase cultural diversity through the creation of a collective textile piece. The second objective elevates the initiative to a level of critical research: the need to discuss the semantics of language surrounding traditional crafts, whose definition has been reinterpreted and understood through cultural frames of reference. The research seeks not only to show, but also to question the concepts of the traditional and the representative in a multicultural context.

This research is primarily quantitative and descriptive, and to a lesser extent qualitative; a hybrid approach designed to address both the scale of the project and its conceptual depth. The quantitative descriptive phase involves recording and documenting the textile pieces in an inventory. This provides an overview of the geographical scope and volume of the works. The qualitative phase, on the other hand, focuses on exploring the symbolic and intangible dimensions of textile heritage through the information collected in the work files.

The most significant finding lies in an apparent lack of data: 15% of the textiles registered did not include the artist's name or further detailed information about techniques and materials. Far from being a simple gap in the information, this data is a crucial revelation about the state of the crafts. The absence of data is not accidental: it is a manifestation of the informality and lack of protection that characterizes the craft sector in many parts of the world, which strips the work of its context, its history, and its link to the person who created it.

The research essentially argues that textiles are not mere objects, but rather a dynamic means of cultural expression that is constantly being reconfigured. The preliminary findings, particularly the gaps in information about creators and techniques, do not represent a failure of the study, but rather a fundamental discovery that highlights the structural vulnerabilities of the craft sector. Thus, the "Weaving Hope" project emerges as an innovative model for intercultural dialogue and a call to action for design and academia to become active mediators in the revalorization of cultural identities at a global level.

CENSUS ON INDIGENOUS PEOPLES INSIDE THE GLOBAL GEOPARK NETWORK: A FIRST STEP TOWARD DIFFERENTIATED RECOGNITION OF RIGHTS

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Keywords: indigenous peoples, geopark, cultural recognition, participatory governance, territorial inclusion

The Indigenous Peoples Census initiated in April 2023 by the GGN Indigenous Peoples Working Group (GGN-IPWG) marks the first attempt within the UNESCO Global Geoparks (UGGp) framework to recognize and document the presence and cultural diversity of Indigenous communities living within Geopark territories. This initiative reflects the broader international commitments undertaken by UNESCO, including the UN Declaration on the Rights of Indigenous Peoples (UNDRIP, 2007), the LINKS programme, and the International Decade of Indigenous Languages (IDIL 2022–2032), all of which emphasize the collective rights of Indigenous Peoples to their lands, cultures, and knowledge systems.

Of the 177 UGGps designated in 2023, 86 (49%) were identified as potentially concerned by Indigenous presence. Among these, 39 Geoparks responded to the survey, revealing approximately 1.3 million Indigenous inhabitants, belonging to 62 identified groups speaking 49 distinct languages, most of them oral. These findings highlight the extent to which many Geoparks are situated on historically Indigenous lands—yet this reality is not always reflected in their governance structures or interpretive narratives.

The census brings to light a structural contradiction: while UNESCO explicitly calls for the full and effective participation of Indigenous Peoples in heritage governance (UNDRIP Articles 18–19; CDIP/UNESCO, 2017), very few Geoparks have implemented formal mechanisms for consultation, representation, or shared decision-making. In some national contexts, the documentation of Indigenous presence remains sensitive or even avoided, due to concerns over land rights or potential legal challenges.

The data also point to regional disparities in Indigenous recognition. Some Geoparks—in Latin America, Africa, or Southeast Asia—have more openly acknowledged Indigenous presence and diversity. In other regions, however, engagement has been more limited or cautious. This situation calls for a second phase of the census and a broader reflection on how Geoparks can move from a logic of heritage labeling to one of heritage justice.

This preliminary report argues that UGGps must move beyond being symbolic or extractive cultural showcases and instead become spaces of genuine recognition for Indigenous collective rights, in full alignment with the international legal and ethical frameworks upheld by UNESCO.

RELATIONSHIP BETWEEN MAPUCHE CULTURE AND ITS NATURAL SPACES, BASED ON ORAL HISTORIES

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Keywords: mapuche, pewenche, Araucaria, Kimün

This work is born from our experiences as inhabitants and natives of the Pewenche territory. We learned about the transhumant practices of staying in the community during the winter, but during the piñones season, we would climb the hill with all the necessary things: tools, pots, dishes, beds, chickens, dogs, and cats. We all moved, staying there for about two months. We had places to sleep and cook. In those contexts, the grandmothers' stories flowed around the fire, oral historical and spiritual tales. These days, such things are no longer seen; the elders have left, and the youth are no longer interested in that life. Few people live in piñones, as they instead dedicate themselves to decontextualized tourism.

Life revolves around the araucaria, the tree that, according to the Mapuche, is the source of food for making bread, soup, and muday. In times of scarcity, the Pewenche people were able to survive thanks to its fruit. The araucaria bears witness to many stories; it represents life. Dreaming about araucaria trees is a good dream, but dreaming that one falls is a bad dream. In 2015, a fungus capable of causing the extinction of this species was discovered. Institutions do not approach the communities to inform them about this problem. Most people are unaware of the reason for the accelerated deterioration of this aliwen. Currently, decisions are made without considering Mapuche Pewenche knowledge. They dig up the soil to install drinking water and irrigation pipes, build roads, and, if necessary, cut down these trees. Therefore, this work seeks to restore the importance and validity of this Kimun knowledge that still endures in the communities and lof. Regarding the names, we will move between Peweñche, Pewenche, Peweñ, and Pewenh as a demonstration of the linguistic diversity of a single territory.

ARCHAEOLOGY FOR CULTURAL ASSESSMENT IN GEOSITES. THE CASE OF MELIPEUCO (UNESCO GLOBAL GEOPARK KÜTRALKURA, CHILE)

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Keywords: archaeological heritage, geoarchaeology and biogeography, paleoenvironment and paleoclimate change, geohazards risk, Science and Research in Geoparks

An early emphasis on biodiversity rather than geodiversity in Protected Natural Areas was sustained until the introduction of assessments of "geosites," "geomorphosites," and of the definition of "geoparks". The more recent cultural component interest of geo-sites has shown progress, however there is still limited integration of archaeological knowledge to it. Particularly, regarding human-societal relationships with the environment. This challenges the development of methodologies to assess in a more integrated way the components of geoparks.

Archaeology, through approaches such as geoarchaeology and human biogeography, applied together and at various time scales, allows us to reconstruct the environmental conditions prior to settlement, analyzing human interactions with a changing environment, and understand their effects on survival, sociocultural organization, and the processes of archaeological alteration, preservation, and visibility. This perspective can contribute to a more accurate assessment of archaeological components in geosites and geoparks, without losing their "geo" orientation, but precedents for this type of approach are still scarce.

This work discusses and demonstrates the potential of the proposed perspective, using as a case study the research carried out in the southern sector of the Kutralkura UNESCO Global Geopark. The study area is the Allipen (Melipeuco) River Valley, representative of the Southern Andes, characterized by tectonic, glacial, and fluvial geomorphology, particularly by the Llaima and Sollipulli volcanoes active since the Late Pleistocene, with human occupation since the mid Holocene. During the Holocene, this space contained residential settlements and extractive industries of biotic and abiotic resources such as obsidian, and may have been part of a transcordilleran and bioceanic network of human circulation of ideas and goods (obsidian, ceramics, etc.). However, the spatio-temporal paleoenvironmental, biogeographic, and paleoclimatic variability, and their influences on human uses of spaces at different scales and their changes or persistence and vice versa, as well as the impact of natural and anthropogenic processes on archaeological visibility, preservation, and spatial distribution, are unknown.

Our proposal combines an integrated analysis of the paleoenvironmental and paleogeographic context, the spatial distribution of settlements, analysis of lithic and ceramic artifacts, and the contribution of ethnohistorical sources. The main results are presented and their usefulness for defining and testing qualitative and/or quantitative criteria for archaeological cultural assessment, tailored to the specific themes of the Geopark, is discussed in future work.

BETWEEN WEAVES AND WORDS: NARRATIVES FROM A COMMUNITY WEAVING PROJECT

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Keywords: community weaving, craftswomen, intangible cultural heritage, textile art, Araucanía

This paper explores the *2020 Tejido Fraternidad* project, a sociocultural initiative led by the Universidad Católica de Temuco and the Tierra del Encuentro Foundation, which took place in the Kütralkura UNESCO Global Geopark in the Araucanía Region of Chile. The project articulated textile art with the empowerment of Mapuche and non-Mapuche women through community-based and collaborative processes. By studying the life stories of the participating craftswomen, the project sought to understand the meanings constructed around weaving as an identitying practice, as a form of resistance, and as a vehicle for social transformation.

This research investigates the life stories of Mapuche craftswomen from the Kütralkura Geopark and Araucanía who participated in the *2020 Tejido Fraternidad* project, with the aim of validating the importance and social impact of this, and similar cultural initiatives, in the Region. The work considers the territorial and cultural context of the Region, the relevance of weaving as intangible cultural heritage, and the current status of the artisanal craft. Using a qualitative and narrative approach, testimonies are collected that demonstrate the impact of the project on the personal and collective trajectories of its protagonists. The analysis is based on theoretical frameworks linked to community art, the economy of solidarity, and studies of narrative as a construction of meaning.

This research was primarily qualitative and exploratory in nature. Methodologically, it employed semi-structured interviews, content analysis, visual recordings, and life story techniques, prioritizing the collaborative construction of knowledge. Documentary photography was integrated as a methodological and archival tool, highlighting its capacity to represent social processes from an ethic of care and co-creation.

After reviewing the regional context, Mapuche textile heritage, and community art practices, it is apparent that weaving is much more than just a technique: it is a language loaded with memory, identity, and resistance. The most significant results show that, when evaluating the project four years after its implementation, it has had a sustained impact on emotional empowerment, the appreciation of the textile trade, the creation of networks among women, and the public exhibition of artisanal work.

It is concluded that the *2020 Tejido Fraternidad* project is a cultural experience that can be replicated in other Geoparks around the world. It promotes the empowerment of women through their knowledge and territories, and offers an alternative to extractive or welfare-based models. In the future, we propose the publication of a narrative and visual compilation of graphic material that combines personal stories, images of textile pieces, and photographic documentation of the process. This material will serve as a means of capturing collective memory, cultural dissemination, and aesthetic redefinition of contemporary Mapuche weaving.

PERFECT INTEGRATION BETWEEN CULTURE AND NATURE

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Keywords: geoparks, tangible and intangible cultural heritage

Lushan UNESCO Global Geopark, located in northern Jiangxi Province, China, south of the Yangtze River and east of Poyang Lake, covers an area of 548 square kilometers. Inscribed on the UNESCO World Heritage list as China's first World Cultural Landscape in 1996, it became one of the first members of Global Geopark Networks in 2004.

Lushan is distinguished by its unique and complex multi-genetic landforms, shaped by Quaternary glacial erosion, Horst fault-block mountains, and metamorphic core complex landforms.Remarkably, Lushan is the birthplace of China's Quaternary Glacial Theory.The combination of the mountain, the Yangtze River, and Poyang Lake creates breathtaking scenery and a superior natural ecosystem. Its landforms are intricately linked with botany, culture, and history.

The region is abundant in natural beauty, featuring dense forests, flowing streams, cascading waterfalls, picturesque gorges, rugged ridges, and towering peaks. The excellent water transportation and developed economy have historically contributed to the prosperity of economic transfer centers, such as the four major rice and tea markets in the regions south of the Yangtze River. The enchanting scenery has inspired countless literati and artists, resulting in a diverse cultural landscape.

In modern times, Kuling in Lushan has become a renowned summer resort for both Chinese and foreigners. With a strong historical inheritance and deep Chinese and Western cultural roots, Lushan Geopark stands as a cultural sacred mountain.

Poetry, rock inscriptions, and painting have been deeply inspired by the beautiful geological landscape of Lushan. Over 4,000 scholars have visited the mountain, composing 16,000 poems and verses and inscribing 1,000 tablet inscriptions and stone carvings. Lushan is widely recognized as the cradle of Chinese landscape painting and landscape poetry.Residents from 20 countries once lived on Kuling of Mount Lushan , leaving behind over 600 villas blending Chinese and Western architectural styles scattered across the mountain valley, which is hailed as the Museum of International Architecture. along with its rich religious culture, poetry culture, academy culture, and the integration of poetry, rock inscriptions, and landscape paintings, all contribute to its distinctive cultural heritage.

The White Deer Cave Academy embodies the enduring influence of Neo-Confucianism over the past 700 years, showcasing Lushan's profound traditional Chinese culture. Additionally, Lushan boasts a rich ancient Chinese medicine culture and a unique tea culture, particularly renowned for its cloud-mist tea.

Among Lushan's intangible cultural heritages are stone-worker chants, Xihe opera, cloud-mist tea production techniques, and stone-carving skills. With its long history, rich cultural heritage, and superior natural ecological conditions, Lushan truly stands as a cultural sacred mountain.

EFFORTS IN PRESERVING INDIGENOUS LANGUAGES IN NON NUOC CAO BANG UNESCO GLOBAL GEOPARK

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Keywords: indigenous, ethnic languages, preservation, sustainable development

Non nuoc Cao Bang UNESCO Global Geopark (CBUGGp) is home to different ethnic minority groups (Tay, Nung, Mong, Dao, San Chi, Lolo, etc.), which account for more than 90% of Cao Bang province's population. Each ethnic group has its own language and cultural identity, which enrich the cultural and intangible values of the Geopark.

Indigenous languages (ethnic languages) are considered an important tool to learn about the past and culture of ethnic groups, as well as invaluable capitals for tourism development. Over the years, NNCB UGGp has made efforts to preserve and promote indigenous languages in the Geopark territory. The Geopark has cooperated with relevant localities in Geopark territory in preserving and promoting ethnic languages. Activities include courses on ethnic languages, folk song teaching, and branding local services in ethnic languages, etc. News and reportages translated into ethnic languages and broadcasted on the provincial TV and Radio station are not only not only disseminate updated information to ethnic groups but also serve as a means of preserving and promoting the languages. Particularly, the preservation of ethnic languages has been carried out in schools via the "Geopark Ambassador" clubs. The clubs have carried out diverse activities such as introducing geosites in ethnic languages, painting, folk singing, making videos or conducting extracurricular sessions in ethnic languages, acquiring language knowledge and wisdom from the old, etc. These efforts help to raise awareness of students and local communities about the importance of preserving ethnic languages, and evoke a sense of pride among students in their ethnic languages and cultural identity. Recently, a competition on "preserving ethnic languages" was organized with the participation of students from secondary and high schools in the Geopark territory, which created a strong communication impact. With its profound educational significance, the contest affirmed the role and responsibility of the young generation in safeguarding indigenous languages, in line with the implementation of SDGs of NNCBUGGp.

The presentation will focus on examining the initiatives and efforts of CBUGGp in preserving ethnic languages as well as to safeguarding and promoting distinctive cultural heritage of the Geopark for sustainable development.

ACTANT VOLCANOES: STRAINING OUR RELATIONSHIP WITH THE KÜTRALKURA GEOPARK AT THE CROSSROADS BETWEEN NATURE, TECHNOLOGY AND ART

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Keywords: art, multispecies, geo-aesthetics, technodiversity, territorial interpretation

This project proposes a critical and sensorial exploration of our relationships with the Sollipulli and Lonquimay volcanoes, located in the Kütralkura UNESCO Global Geopark, based on the intersections of nature, technology, and art. Through a performative methodology that combines art, the assembly of accessible technology, and artistic reflection, the project seeks to challenge dominant formats—rooted in Western modernity—in which we generate knowledge about the natural environment, visualize it, and relate to it.

The theoretical approach is inscribed within Yuk Hui's paradigm of technodiversity, which proposes an opening to multiple forms of technical-cultural knowledge, detached from the universalizing logic of Western technoscience. The project also positions itself as a critique of extractivism and the ontological structures of Western modernity, which have historically conceived territory as simply a resource open for exploitation. Consequently, an ontoecological perspective has been proposed (Descola, Haraway, Barad), where nature, culture, and technology are not conceived as separate domains, but rather as intrinsically intertwined dimensions. Finally, inspired by the *Ch'ixi* thoughts of Silvia Rivera Cusicanqui, the device operates from deviation and amalgamation, functioning as a hybrid device that does not seek to resolve the contradictions between the ancestral and the modern, the technical and the affective, but rather juxtaposes them in a space of conflictive coexistence.

Regarding methodology, the project employs a techno-diverse artifact, which acts as both a sensory and a narrative probe, assembled from Arduino boards, sensors, recycled materials, and copper. This device was placed in specific contexts within Kütralkura to measure temperature, humidity, light, movement, and sound—including the use of hydrophones—and thus generate a database that was subsequently catalogued and visualized.

For example, when the device was installed on the summit of the Sollipulli volcano on a cloudy day, it captured a strong wind when snowfall was imminent. The results from this position were combined with those obtained next to a meltwater lagoon, hidden among the volcano's ravines. The context of their locations was also recorded in audio and video. Finally, we discovered a small network of flowing water that sustains life in the valley below.

These data help generate an audiovisual metaphor in which the images seem alive, the fruit of pulsating transformations. We seek to visualize more than three dimensions in a linear narrative, by incorporating time into a sensitive presence of all the acting forces with which we coexist, considering the invisible, the audible, and the inaudible. In short, beyond human perception.

Through sensitive metaphors, the integration of these media allows us to relate the interaction between the device and its environment, shifting the notion of scientific objectivity towards a situated and relational praxis. From an ethic that considers humans as part of the biosphere, the project is seen as an aesthetic and educational contribution to the imagination of fairer, more diverse, and more sustainable worlds.

THE COMARCA MINERA (MINING REGION) OF HIDALGO IN LITERATURE

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Keywords: history, mining, viceroyalty, pre-hispanic culture, comarca minera geopark

The Comarca Minera of Hidalgo is a geopark that offers insights into its geological, natural, and human history, thanks to these resources, its story of existence encompasses two historical periods of mining exploitation: The first refers to non-metallic minerals, particularly obsidian, which is a volcanic glass that was used to make arrowheads, tools, and knives, as well as ornaments in pre-Columbian times. The second has more than 500 years of silver exploitation. Given the significance of this territory, several types of documents produced over the years highlight its importance to the economy of New Spain and the Mexican nation. These features made the Comarca Minera stand out, drawing the attention of chroniclers, travelers, and novelists who wrote about it in various books. The texts referenced in this study range from those that analyze the life and culture of ancient Mexican communities to those of the colonial period, such as the works of Fray Bernardino de Sahagún, Lorenzo Boturini, and the stories of the travellers Gemelli Careri and Alexander von Humboldt. As well as miners who conducted studies aimed at exploiting the region's mines, for instance, Ramón Almaraz and Manuel Rivera Cambas. Other stories focus on the lives of the inhabitants, especially miners, as seen in the works of Rodolfo Benavides and Yuri Herrera. This oral exploration reflects the values that shape the essence of the written cultural heritage of the UNESCO Global Geopark Comarca Minera.

LIVING CULTURE IN THE KÜTRALKURA GEOPARK THE EXPERIENCE OF THE MUSEUMS OF CUNCO AND MELIPEUCO

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Keywords: heritage, museography, interculturality and mediation

Context: As dynamic cultural institutions, this research carefully examines the specific and multifaceted roles played by the museums located in Cunco and Melipeuco. Both actively participate in the preservation of biocultural heritage, the construction of territorial identities, and the fostering of intercultural dialogue between diverse communities. Museums, especially those located in the Araucania Region of Chile, are recognized as key players in the cultural configuration of their territories, in a Region marked by historical tensions and systematic exclusions.

Objective: The main objective of this research is to conduct an in-depth analysis of the functions of the aforementioned museums, along with identifying the challenges they face, from a critical intercultural perspective. We seek to highlight their role in promoting cultural and natural diversity, as well as focusing on their contribution to situated museographic practices that articulate memory, identity, and citizenship in the local population.

Method: The research adopts a descriptive qualitative approach. It employs a comprehensive review of documentary and bibliographic sources, analysis of institutional and public policy documents, and a detailed case study of the Cunco and Melipeuco museums. It also incorporates data from the Chilean Museum Registry and considers the broader sociohistorical and territorial context in which these institutions operate.

Results: Preliminary findings indicate that both museums can be classified as territorial museums, as their operational activities contribute significantly to the preservation of cultural heritage and the strengthening of a local sense of belonging. They act as community platforms that facilitate meaningful constructions and the revitalization of local memories. Furthermore, their role as intercultural mediators is reinforced as they establish links between diverse cultures, and operate in contexts marked by exclusion and a colonial past.

Conclusions: The museums analyzed represent strategic territorial actors in intercultural mediation, but they face significant structural limitations. Among the main challenges are their precarious future, limited community participation in museum management, and the absence of a holistic heritage approach. We conclude that it is necessary to strengthen their institutional capacities in order to foster an integrative vision of heritage that incorporates multiple cultural narratives.

TRADITIONAL FOLKTALES AND LOCAL LEGENDS IN REYKJANES UNESCO GLOBAL GEOPARK

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Keywords: intangible cultural heritage, geotourism, storytelling, sustainable tourism, geopark interpretation

Reykjanes UNESCO Global Geopark is home to a dramatic volcanic landscape shaped by the Mid Atlantic Ridge—and also to a rich tapestry of intangible cultural heritage. This project focuses on collecting, curating, and presenting folktales, legends, and community stories linked to geosites and key stops along the Reykjanes Peninsula. Its aim is to deepen the connection between visitors and place through storytelling, and to support sustainable local development by enriching the cultural dimension of geotourism.

The project was conducted in three main phases: (1) **Collection** – Gathering known and lesser-known stories from the region, including ghost tales, folklore, and narratives about local figures. (2) **Presentation** – Selecting stories related to existing tourist sites and integrating them into digital platforms, such as the Geopark and destination websites. (3) **Translation** – Translating selected narratives into English to make them accessible to international visitors and local residents of foreign origin.

By linking these stories with specific geosites—such as the haunting tale of Gunna at Gunnuhver or the legend of Oddný and Brimketill—the project enhances the visitor experience and strengthens the cultural identity of the Geopark. The stories provide an emotional and historical layer to the landscape, allowing guests to engage more meaningfully with the area's heritage.

This initiative supports several of UNESCO Geopark goals: promoting local culture, fostering community engagement, and encouraging sustainable tourism through authentic, place-based interpretation. It also aligns with national and regional tourism strategies aimed at regenerative tourism, innovation in visitor experiences, and the valorization of local knowledge. The stories collected will also serve as a resource for future interpretive materials, signage, and educational content, ensuring lasting impact.

STRENGTHENING LOCAL COMMUNITIES THROUGH GEOPRODUCTS FROM THE UBERABA GEOPARK

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Keywords: geoproducts, development, community, valorization

The Uberaba Geopark Association, responsible for managing Uberaba Geopark, currently has 135 members, 102 of whom are partner businesses, including artisans, confectioners, small rural producers, and self-employed individuals. These partner businesses already operated artisanal activities in the area, but with the Uberaba Geopark's endorsement and after joining the Association, they began enhancing their products with local cultural identity. One example is the "Artes de Uberaba – MG" artisan group, which uses embroidery and looms to create handcrafted pieces that reference Uberaba's history, uniting the traditions of rural and urban communities.

The members received initial training on the concept of a geopark and the history and operations of Uberaba Geopark, as well as the idea of creating geoproducts—an essential step toward obtaining the Uberaba Geopark "geoproduct" and "partner business" certification. Subsequently, with the support of the Uberaba City Hall (PMU) and the Brazilian Micro and Small Business Support Service (SEBRAE MG), members are participating in Product Design training, aiming to improve the aesthetic and functional quality of the items produced, adding value and generating more income opportunities.

As part of its strategy to strengthen and promote these products, the Association has encouraged member participation in fairs and events, promoting the marketing and visibility of geoproducts. Participation in events such as Expozebu and the Peirópolis Winter Festival has proven effective in increasing producers' income, as indicated by preliminary data from 2025. These results highlight the positive impact of partner businesses being linked to the Uberaba Geopark Association, highlighted by the use of the geoproduct seal.

The process to become a member involves filling out a form with information about the business and products, which are analyzed by the Uberaba Geopark team. If approved, producers sign a partnership agreement and gain access to a series of benefits: an official "geoproduct" and "partner enterprise" seal, a user manual, identification materials (such as signs and banners), and ongoing training (training sessions, and workshops).

Furthermore, the Uberaba Geopark Association has acted as a liaison at regional events, negotiating physical spaces for the exhibition and sale of partner enterprise products, reinforcing the Geopark's role as a driver of sustainable development and the creative economy.

This structure strengthens territorial identity, promotes the appreciation of local heritage, and directly contributes to increased income generation, highlighting the Uberaba Geopark's strategic role as a platform for productive inclusion and social innovation.

FROM MINING ACTIVITY TO CULTURAL HERITAGE: THE COMPLEX DEVELOPMENT OF THE HISTORICAL AND ENVIRONMENTAL GEOMINING PARK OF SARDINIA (ITALY)

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Keywords: geoparks, Sustainable Local Development, geoturism, Sardinia

The structural crisis of mining-oriented regions generates complex challenges in terms of redefining the economic architecture of the territory. In this context, tourism development represents an opportunity that has proven successful in various cases.

In the specific case of Sardinia (Italy, the second-largest island in the Mediterranean), mining activities have ancient roots, with a history spanning thousands of years. In modern times, however, a significant revival of exploration and extraction began around the mid-19th century. It is estimated that more than six million tons of metal have been extracted from the island's deposits. The modernization driven by the mining era directly or indirectly involved one-tenth of the Sardinian population and expressed its process of territorialization through the pervasive yet selective transformation of physical space. At the same time, it generated a layered body of technical knowledge that constitutes the most innovative component of the system.

With the decline of the region's traditional industrial presence at the end of the 20th century, a new territorial cohesion was sought through the establishment of the Historical and Environmental Geomining Park of Sardinia (https://www.parcogeominerario.sardegna.it/), essentially aimed at launching a new form of heritage tourism.

However, the creation of the Park—through the formal establishment of its institutional bodies, followed by a largely static initial management phase and a prolonged period of administration by a government commissioner (still ongoing)—has not been accompanied by the emergence of a political and economic framework capable of supporting the development of genuine entrepreneurial vitality. Such vitality would ideally be based on the productive coexistence of traditional practices and innovative elements typical of tourism-driven revitalization processes, which have instead emerged primarily through alternative initiatives built around purpose-driven foundations.

This paper, starting from an analysis of the Park's genesis, aims to critically examine the successes and failures of a trajectory marked by the challenges of institutional and political control, the fragility of the chosen territorial model in relation to UNESCO's priorities for Global Geopark recognition, and the widespread disappointment over unmet expectations—disappointment that ultimately led to the creation of alternative structures with similar objectives.

NARRATING CHANGE: THE KAVALIERHAUS PROJECT AS A MODEL FOR INTERPRETING GEOCULTURAL LANDSCAPES IN TRANSITION

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Keywords: landscape narratives, transformation, transboundary heritage, exhibition

At the heart of two interwoven, transboundary UNESCO-designated landscapes—the Muskauer Park / Park Mużakowski and the Geopark Muskauer Faltenbogen—the *Kavalierhaus Information and Education Centre* is currently being developed as a forward-looking, identity-forming hub. Located on the banks of the Lusatian Neisse River, where natural and cultural heritage intertwine, the centre addresses key themes of relevance to geoparks worldwide: landscape interpretation, climate education, and community engagement in the context of change.

The conceptual core of the Kavalierhaus project lies in its interdisciplinary approach to storytelling. The permanent exhibition adopts a narrative strategy that interlaces physical and anthropogenic factors to convey a coherent, place-based story of the Muskau Arch. This glacial push moraine, with its iconic horseshoe shape, is globally recognized as a textbook example of glaciotectonic deformation. Its striking morphology not only shaped industrial exploitation from the mid-19th to the late 20th century—through coal mining, glassworks, and ceramic production—but also served as the aesthetic foundation for Fürst Hermann von Pückler-Muskau’s visionary park design.

The exhibition, which balances scientific insight with emotional and sensorial engagement, centres around three interdependent themes:

(1) The geology of the Muskau Arch, highlighting the fascination with Earth's dynamic forces;
(2) Climate change, addressing both long-term natural processes and human-induced transformation;
(3) The industrial heritage, tracing socio-economic shifts and the trauma of post-socialist structural change.

By weaving together natural processes, industrial legacies, and cultural narratives, the exhibition offers an interpretative framework that is as informative as it is reflective. Special emphasis is placed on current and future challenges related to the climate crisis and structural change (“Strukturwandel II”), positioning the site as a microcosm of the Anthropocene: a living example of the tension between growth and sustainability, disruption and resilience.

From an educational perspective, the Kavalierhaus aims to become a multi-sensory, participatory space. Through scenographic elements, tactile models, original artefacts, and digital media, visitors are invited to explore layered meanings and interconnections. The centre fosters scientific literacy while encouraging emotional engagement and civic reflection.

Ultimately, the project aspires to reframe landscape interpretation not as static heritage preservation, but as a dynamic, co-creative process of understanding regional identity in times of transformation. It offers an adaptable model for education and communication in geocultural landscapes undergoing profound change.

MOUNT BAEKDU: A HISTORICAL AND CULTURAL LANDSCAPE OF THE KOREAN PEOPLE– GEOLOGICAL HERITAGE IN MOUNT BAEKDU TRAVELOGUES

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Mount Baekdu has long been revered as a sacred mountain of the Korean people and recognized as a symbolic space where nature, mythology, history, and culture intersect. However, contemporary discourse on Mount Baekdu tends to focus primarily on political and geographical issues, such as territorial disputes and border demarcations between North and South Korea or between Korea and China, while interest in the mountain's inherent sense of place and its historical and cultural significance remains relatively limited.

This study seeks to illuminate the spatial identity and human-geographical characteristics of Mount Baekdu, centering on travelogues written by Confucian scholars during the late Joseon period. These records encompass not only observations of the mountain's natural features but also insights into border perceptions, the lives of local residents, and folk beliefs, thereby serving—alongside historical maps—as valuable sources for reconstructing the historical space of Baekdu.

In addition, the study analyzes the geological and cultural value of Mount Baekdu, which was officially designated as a UNESCO Global Geopark by North Korea in 2025. North Korea classified the region into 15 core geosites, presenting it as a "composite heritage" where natural and cultural heritage converge. Given the current division of the Korean Peninsula and the consequent inaccessibility of the site from South Korea, this research reconstructs the spatial image of Mount Baekdu through late Joseon-period travelogues and historical maps, offering an indirect yet meaningful way to engage with the mountain.

THE CULTURAL QUARTER: A TERRITORIAL ANCHOR OF SCIENCE, CULTURE AND IDENTITY IN THE ALGARVENSIS GEOPARK

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Keywords: Algarvensis Geopark, cultural heritage, science communication, community engagement, sustainable tourism

In the heart of the Algarvensis aspiring UNESCO Global Geopark (aUGGp), a unique project is emerging as a model of how local identity, science, and culture can converge to reinforce sustainable development and community engagement. The Cultural Quarter, located in the historic centre of Loulé, is more than a museum district: it is a living platform of interpretation, education, research, and slow tourism that extends far beyond its physical boundaries into the entire 2,428 km² of the Algarvensis territory.

This integrated initiative transforms a group of emblematic spaces, such as the Castle, the Holy Spirit Convent, and a cluster of vernacular buildings, into vibrant cultural and scientific hubs. The first key heritage anchor has already been inaugurated: the Islamic Baths (the only known in Portugal classified as a National Monument) and the Barreto Manor House. These sites not only preserve tangible heritage but also tell stories of continuity, transformation, and community identity through immersive, inclusive, and participatory museography.

The Cultural Quarter was conceived not as a top-down project, but as a locally rooted initiative that grows from the territory and speaks of and for its people. It is a flagship of the Algarvensis Geopark's vision: a place that invites visitors to wander through stories, between buildings and geosites, linking urban cultural experiences with the broader natural and geological heritage of the Geopark.

The museum experience is open and polyphonic, inviting dialogue, enchantment, and a deep connection with the landscape and its narratives. In its second phase, the Cultural Quarter will renew the Loulé Municipal Museum to include new synthesis exhibition, telling the story of hearth - on geology, biodiversity, paleontology and the story of human occupation in the territory – as an example, the Southwestern script - the earliest known writing in the Iberian Peninsula, for which the Algarve region is a key cradle. Importantly, a new paleontology and the renew archaeology lab will be established, the first paleontology of its kind in the Algarve, and all south of Portugal, to process fossils from the territory.

This scientific infrastructure will not only support research, but also democratize knowledge, returning it to communities through dynamic temporary exhibitions and educational outreach.

The Cultural Quarter is thus a strategic anchor for the Algarvensis Geopark Aspirant, embodying the core UNESCO values of education, conservation, and sustainable development. It contributes to job creation in science, culture, and tourism, supports creative industries, and

integrates heritage into urban regeneration. By operating year-round and engaging with the wider Geopark network of activities, it mitigates seasonality and strengthens the connection between people and place. Above all, this project exemplifies how a Geopark can act as a catalyst for regional identity and cohesion.

The Cultural Quarter is not an isolated museum project; it is a territorial project, born of and belonging to the Algarvensis community, reinforcing its capacity to interpret, celebrate and sustainably develop its heritage from within.

ASPIRING LENGGONG UNESCO GLOBAL GEOPARK AND CULTURAL HERITAGE SITES: WHERE EARTH AND HUMAN HISTORY INTERTWINE

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Keyword: Lenggong Valley, Aspiring UNESCO Global Geopark, cultural heritage, geoheritage, Malaysia

The Lenggong Valley, located in the state of Perak, Malaysia, is internationally recognised for its geoarchaeological significance and was inscribed as a UNESCO World Heritage Site in 2012. Building upon this foundation, the Lenggong region is advancing its candidacy as the Aspiring Lenggong UNESCO Global Geopark (UGGP), covering 2,248 km² across five sub-districts in the Upper Perak District. This initiative integrates natural, cultural, and geoheritage resources into a comprehensive framework of conservation, education, and sustainable development.

The Aspiring Lenggong UGGP is distinguished by its convergence of geoheritage, bioheritage, and cultural heritage. It encompasses 39 geoheritage sites, including two of global and six of international significance, alongside eight bioheritage and 11 geoarchaeological sites. Complementing these are 21 tangible and intangible cultural heritage assets such as prehistoric cave paintings, traditional Malay settlements, Orang Asli cultural practices, traditional foods, and sustainable fishing methods. Together, these elements narrate a unique story of human history and interaction with nature.

Governance of the geopark is driven by a co-management framework involving federal agencies, the Perak State Government, the Lenggong District Council, the Department of Forestry, and the Department of National Heritage. The Geopark Management Unit (GMU) coordinates conservation, tourism, and community development, while geoguides, cooperatives, and geopartners ensure active community involvement.

The geopark's development strategy is anchored on three pillars: (i) conservation of natural and cultural heritage, including strict protection of forests and archaeological sites; (ii) education and research, supported through scientific expeditions and geopark school modules; and (iii) sustainable development, which promotes geotourism, geofood, geocrafts, and heritage based entrepreneurship. These efforts safeguard Lenggong's heritage while improving socio economic opportunities for local communities, many of whom remain economically vulnerable. By fostering geotourism packages, cultural festivals, and community enterprises, the Aspiring Lenggong UGGP demonstrates how geoparks serve as platforms for sustainable regional development. The integration of the Lenggong Valley World Heritage Site within the geopark framework further enhances coordinated management and strengthens its global relevance. In conclusion, the Aspiring Lenggong UNESCO Global Geopark exemplifies the interconnection between Earth's history and human culture. Its nomination underscores the significance of combining conservation, education, and community empowerment to achieve sustainable development, while contributing meaningfully to the global geopark network.

GEOHERITAGE? A PROPOSAL FOR SOCIAL CONSTRUCTION OF GEOLOGICAL HERITAGE FROM THE PILLANMAPU GEOPARK PROJECT

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Keywords: Research in Geoparks, geosites inventories, geoheritage social construction

Historically, the establishment of criteria by which an expression—whether natural or cultural—is recognized as heritage has followed hegemonic logics, wherein designations are typically made by expert groups, often linked to institutional frameworks within spheres of influence. However, in recent decades, the discourse surrounding heritage conceptualization has shifted the paradigm regarding when expressions are effectively considered heritage. Certain authors argue that elements with potential to be conceived as heritage must undergoes patrimonialization processes, consisting of heritage enhancement and activation through the discourse generated around the element, which inherently possess social and ideological burden, supported by the memory and identity of local community. In this sense, heritage should be understood as a social construction that legitimizes heritage expressions through community recognition. Transforming what is meaningful to a community into heritage relevance thus constitutes one of the most effective tools for conservation.

In response to these paradigm shifts regarding heritage conceptualization, the Pillanmapu Geopark project has developed a five-stage methodology to encourage the social construction process of geological heritage by involving communities in the creation of its geosites inventory: 1) Identification of geodiversity elements with heritage potential through participatory mapping, highlighting sites considered relevant and thus valuable to the community, 2) Qualitative assessment of geosites through field studies involving key stakeholders, 3) Quantitative assessment of geosites, integrating landscape assessment methodologies to redefine the indicator of 'Beauty, Spectacularity or Aesthetic Value' widely used in national and international methodologies, 4) Legitimizing results through participatory workshops, and 5) Transfers the outcomes to the community. Throughout this five-stage methodology, 10 geological frameworks and their 31 representatives geosites were incorporated into the inventory that Pillanmapu currently promotes through its geoeducation, geoturism and geoconservation activities.

This work is expected to continue inspiring community involvement in the development of geosites inventories, as well as contributing to the ongoing discourse on how geological heritage is conceived, how is integrated into territorial memory and identity through participatory perspectives, and how is approached as a social construction that validates its heritage significance, laying a foundation for effective geoconservation.

A GEOSITE OF MY OWN

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Keywords: conservation, monitoring, Citizen Science, education, Sense of Belonging

Fostering a sense of belonging and raising awareness of geodiversity and geoheritage has historically been challenging, as these narratives often involve abstract concepts and temporal scales far removed from the everyday lives of local populations. This disconnect can increase the risk of degradation, including vandalism, of these valuable sites.

In this context, monitoring strategies are essential for the effective management and conservation of geological heritage. They play a crucial role in identifying both natural and anthropogenic factors that may threaten the long-term sustainability of geosites. Today, citizen science is emerging as an effective approach to bridging gaps in geosite supervision. While this method does require investment, it is cost-effective, especially when compared to conventional strategies that rely on dedicated monitoring teams without community involvement. Moreover, the long-term results of such participatory initiatives demonstrate their value as sustainable investments.

With this in mind, the Estrela UNESCO Global Geopark (UGGp) developed the project "A Geosite of My Own", which follows a threefold, integrated approach aimed at promoting geoconservation and engaging the local community in heritage protection strategies.

The project's main actions include:

i) conducting a pilot assessment of the conservation status of selected geosites within the Estrela UGGp, along with the ecosystem services they provide;
ii) raising awareness among school-aged youth about geodiversity, the ecosystem services it supports, and the importance of preserving and using these resources sustainably; and
iii) developing an innovative technological tool to support the preservation of the region's natural heritage.

Due to its novel and inclusive approach, this initiative was selected as part of the UNESCO abrdn Projects list. This recognition was instrumental in supporting its implementation, allowing for impactful, UNESCO-backed actions within the Estrela territory. Launched as a pilot programme, the project is designed for scalability across the Estrela UGGp and has the potential to be replicated in other UNESCO Global Geoparks around the world.

In summary, geoheritage is the cornerstone of a UNESCO Global Geopark, and promoting community engagement in its protection is of vital importance. Through the implementation of "A Geosite of My Own", a significant step is being taken towards enhancing and safeguarding the unique values of this territory, one that represents a chapter in the grand narrative of planet Earth.

PASTORALISM, AN EMBLEMATIC ACTIVITY OF THE CAUSSES DU QUERCY GEOPARK

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Keywords: pastoralism, ewe, partnership, sustainable local development

The Causses du Quercy UGG is a karstic territory where valleys alternate with limestone plateaux. On these vast stretches of land, it's not unusual to come across the spectacled ewe, the Causses du Lot, which is characterised by its black ears and eye rims.

Livestock farming and pastoralism have long helped to shape these landscapes: open grasslands and meadows, undergrowth, dry stone walls to demarcate plots of land, shepherds' shelters, farms and barns, waterholes dug into the rock to water the flocks,... There are over 120 000 sheeps in the Geopark, 50% of which are Causses du Lot ewes. Today, with a decline in the number of farmers and ewes, the natural environments are tending to close in and the area of dry grassland is shrinking.

The ubiquitous limestone leads to poor soils and difficult access to water resources. The Causses du Lot ewe is particularly well-suited to these conditions, thanks to its resistance to disease (particularly pyroplasmosis), its ability to walk and go without water for long periods, and its ability to adapt to uncertain forage resources.

In partnership with OVILOT, the breed selection body for the Causses du Lot breed, the Lot Chamber of Agriculture and the Lot Department, the Geopark is working to maintain pastoral activity and the economic value of the sector.

Several areas are being worked on:

- The creation and management of pastoral land associations involving landowners, with the aim of preventing the risk of fire by reclaiming overgrown areas, preserving outstanding landscapes, maintaining a diversity of flora and fauna, and providing additional spontaneous fodder for livestock;
- Adding value to the wool: creating yarns, testing mulching when planting hedges, creating a micro-washing station, using it as insulation in buildings;
- Revitalising local consumption of meat from Causses du Lot ewes;
- Promoting tourism by creating an interpretation trail for ewes.

Through these actions, the Geopark is helping to involve local stakeholders in the preservation and management of biodiversity, particularly dry grasslands. It improves the added value of agricultural production and strengthens the sheep industry. It works to mobilise all stakeholders to maintain, develop and promote pastoralism.

In 2026, the Causses du Quercy Geopark will be offering a series of events as part of the International Year of Pastoralism and Grasslands. This will also be an opportunity to showcase other geoparks around the world where pastoral activity is important.

STATIONS, BRIDGES, AND TUNNELS OF THE CORDILLERANO RAILWAY OF THE KÜTRALKURA GEOPARK

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Keyworks: Araucanía, territory, railway infrastructure, monuments

La Araucanía was an unexplored territory during the first half of the 19th century, so a military plan was initiated to incorporate the region known until then as "The Frontier". Once the "Pacification" process of Araucanía was consolidated toward the end of the 19th century, the government of José Manuel Balmaceda began economic integration, where the railway played a fundamental role.

The railway was built by the State as a policy to promote economic and social development and consolidate political and administrative control of the country, annexing this fertile territory to the national economy. It continued the central line and later a series of branches to various points in the mountains and the coast.

This infrastructure and legacy faced various challenges, especially in the mountains, due to both its geography and its hostile climate. It managed to connect and subjugate the territory through tunnels, bridges, and stations, with sophisticated engineering solutions that are now part of the UNESCO Kutralkura Geopark.

Thus, the Púa-Lonquimay branch line was born, initially seeking to defend the border and later connect both oceans and unite Bahía Blanca and Talcahuano, as a channel for exploiting the area's vast forest resources.

Today, its route still bears witness to that intense adventure, an inseparable expression of this important means of transportation and the landscape. The disappearance of this branch line brought about significant transformations in various towns. Many of the jobs associated with waiting for the train were lost: the egg bread vendor and other jobs associated with ticket punching, the stationmasters' whistles, among other things.

For this reason, this entire cultural confluence was unfortunately lost, and many towns that had been born under the protection of the railway began to progressively decline, even disappearing. All that remains is the vivid memory and nostalgia of the passengers who once waited at the ancient pillars of their stations. Therefore, it is necessary to generate a serial file that allows us to survey that railway infrastructure and reconnect it with the memory of its inhabitants.

CONNECTIONS BETWEEN GEOLOGY AND INDUSTRIAL HERITAGE IN MËLLERDALL GEOPARK (LUXEMBOURG)

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Keywords: geoheritage, industrial heritage, interpretation

The connections between geological heritage and (pre-)industrial heritage are evident at numerous sites in the region of the Mëllerdall UNESCO Global Geopark—sometimes clearly visible, other times more subtly so. As early as the 16th century, salt was extracted from a saltwater spring, and in the 18th century, iron was smelted from iron ore in blast furnaces, using energy sourced from waterpower and charcoal. In the 18th century, railway lines were constructed to facilitate the transport of building and dimension stones from long-established quarries. Local loam has been used since the Stone Age and remained the foundation for regional pottery production well into the 20th century. Today, all but two of the region's stone and loam pits have been abandoned and have evolved into habitats for rare flora and fauna. Often, the knowledge of the human origin and historical significance of these sites is being forgotten.

The Mëllerdall Geopark is exploring these interconnections through a project in collaboration with various partners from the so-called "Greater Region" (GR: Luxembourg and parts of Belgium, Germany, and France; among others, the Famenne-Ardenne and Vulkaneifel Geoparks are project partners). The project "Sous nos Pieds" ("Beneath our feet") is co-financed by the European funding program INTERREG VI-A GR as well as by national contributions. It aims to gather historical and environmental knowledge about specific sites (e.g. through archival research) and to enhance these locations for tourism and education. A database structure is being developed in QGIS for data collection, which will enable long-term storage and accessibility of information on regional features—ranging from oral history to scientific literature—on a variety of themes.

As part of the project, selected geosites and former industrial sites are being enhanced by creating tourist and educational offerings. The sites will be made accessible (including barrier-free access), and their visibility will be increased through innovative tools such as virtual or augmented reality. New (cross-border) experiences will be developed. This is supported by coordinated communication within a cultural and tourism network in the Greater Region (targeting the general public, tourists, etc.).

An initial implementation of the project will be presented using the example of a former ironworks that operated from 1768 to 1812 in one of the Geopark's member municipalities.

EL HIERRO GEOPARK, GUARDIAN OF ITS TRADITIONS: SILBO HERREÑO AND JUEGO DEL PALO, CULTURAL AND NATURAL HERITAGE

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Keywords: cultural heritage, communication, networking

The island of El Hierro, with an area of 260 km², is the second smallest in the Canary archipelago and the least populated. Its young geology, barely a million years old, and its rugged terrain with deep ravines and large landslides have shaped both the landscape and the way of life of its inhabitants. Despite modernity, the island preserves many of its traditions and cultural elements, both tangible and intangible.

Among them stands out the *Silbo Herreño*, a whistled communication system developed to overcome the challenges of the mountainous terrain. This language allows for the transmission of complex messages over long distances by imitating speech through tonal variations. It is a unique expression of local identity with significant historical, linguistic, and cultural value. Traditionally used by shepherds and farmers, its use has declined over time due to emigration and modernization, placing its continuity at risk.

Another important cultural element is the *Juego del Palo* in its *Quintero* style, a physical-cultural practice with pre-Hispanic roots that used wooden sticks (staff, cane, etc.) for training, self-defense, or play. Although it dates back to before the 15th-century conquest, the tradition has endured and evolved, incorporating European influences and adapting to local styles. This technique, involving symbolic duels without actual physical contact, fosters coordination, strategy, and discipline. Historical documents from the 17th century already reflect its use, and it has been preserved through oral transmission across generations.

Both traditions are considered elements of intangible cultural heritage and are currently at risk of disappearing. Therefore, their designation as *Assets of Cultural Interest* is proposed: *Silbo Herreño* under the category of "Island-wide Oral Tradition and Expression," and *Juego del Palo*, in its *Quintero* style, under the category of "Native Games and Sports."

With the aim of declaring these traditions *Assets of Cultural Interest* and preserving their revitalization by offering legal, social, and educational support, the El Hierro Geopark, together with the Heritage and Culture Department of the Cabildo and the Scientific Body of the El Hierro Geopark, are working on the documentation to support this proposal, promoting their inclusion in cultural and tourism activities, as well as in education, emphasizing a strong commitment to the island's cultural heritage.

THE VALUE OF WATER: INTANGIBLE CULTURAL HERITAGE IN THE ALLIPÉN RIVER BASIN, ARAUCANÍA REGION

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Keywords: water landscape, intangible cultural heritage, relational values of nature

This study seeks to understand the process of signification of the water landscape in the Truful-Truful waterfall area, located within the UNESCO Kütralkura Global Geopark, Araucanía region, Chile. In this place, water is a element of conflict and the decisions that affect it do not take into account the meanings, expressions, and experiences of its inhabitants, the vast majority of whom are Mapuche-Pehuenche. We focus our study on the meanings of water, which take the form of practices and knowledge, allowing us to explore the subjectivities of the community. Our objective was to elucidate the role that water plays in everyday life and how it can be preserved as an intangible heritage asset.

We question the neglect of cultural heritage in the face of environmental problems that impact people's ways of life. To this end, we studied the General Environmental Law and the Heritage Law, currently under consideration in Chile. We also considered the Environmental Impact Assessment Service (SEIA) and the Baseline Report as its main assessment tool. This report is prepared by the project owners, with the assistance of consultants who specialize in these issues, which raises two major problems. First, this report considers the components of the landscape only from an aesthetic and visual perspective, as isolated units rather than as elements belonging to an ecosystem. Second, it does not set limits for measuring the impact in these areas, but leaves such limits up to the discretion of those who prepare the report.

This research was based on the plural values of ecosystems, categorized into intrinsic values, instrumental values, and relational values, following the guidelines of Briggitte Baptiste and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). Focusing on relational values, this research develops a descriptive methodology with a qualitative approach, based on data obtained from primary and secondary sources. Interviews were conducted with experts to investigate legal and technical issues, and conversations were held with the community to gather life stories and thus gain insight into their value systems, representations, beliefs, and symbolism. Non-participant observation and document analysis were also carried out.

Based on this, we conclude that water culture is a decisive value that must be protected, because it is a natural resource that impacts the symbolic, cultural, material, physical, and natural aspects of the territory. These aspects must be considered so that landscapes such as Truful Truful do not disappear. In this sense, it is essential to make intangible activities visible through mechanisms that consider the relational values of nature as a tool for integrating intangible cultural heritage, in order to rescue and territorialize its practices and knowledge.

GEOLOGY AND MAPUCHE KNOWING: A GEOLOGICAL APPROACH TO TERRITORIAL KNOWLEDGE

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Keyword: communication, geology, territory

The usual way to promote knowledge is through conversations and dialogues between people. Conversations—Güxam—in Mapudungun are the result of successive observations and interactions with nature and the social context, understood as part of the fabric of the territory. From this perspective, the need arises to connect the Mapuche worldview with the most fundamental scientific knowledge, in this case, geological knowledge, its landforms, and its processes, which are a fundamental part of the intangible dimensions of Wallmapu.

This work outlines a proposed glossary of geological terms and definitions, concepts, and notions in Mapunzugun, derived from the knowledge constructed by the Mapuche. This enables the surgence of concepts and notions at different levels of correspondence in the Mapuche language, focusing on features and descriptions related to the linguistic and knowledge dimensions. Mapuche notions are expressed in various dimensions linked to life in the territories, especially the spiritual, and therefore, a particular form of connection expressed in a form of care and respect for nature. On the other hand, geology is a science that explores different geographic environments, in which it must access areas where the inhabitants do not know what a geological study is, and the other party does not know how to explain what it does in appropriate terms to achieve its objective. Therefore, it is an approximation not only at the linguistic level but also between two worlds of knowledge. In the process of developing this glossary, we encountered the difficulty of expressing the concept in scientific language and in Mapudungun, since the intention is to avoid falling into a translation of the terms. Establishing a descriptive geological concept assumes, for the vast majority, a symbolic concept in Mapuche knowledge. An example of this is the term "volcán- zeqüñ" and what is mostly associated with the "pillán" (volcano spirit). As a scientific process, we also aim to verify that what is expressed corresponds to the definition, resulting in the return of the cycle. For this purpose, different communities are consulted to see if the term or concept in Mapudungun provides the desired information. With this work, we hope for good communication between both interested parties.

REHABILITATION OF AN AGGREGATE EXTRACTION SITE ON THE CAUTÍN RIVER USING ECOLOGICAL, CULTURAL, AND TERRITORIAL DESIGN STRATEGIES

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Keywords: territorial research, aggregate extraction, indigenous communities, landscape design, ecological and cultural rehabilitation

The Cautín River is a key territorial structure within the UNESCO Kütralkura Global Geopark. It originates in the foothills of the Llaima volcano and flows for 174 km before joining the Cholchol River, giving rise to the Imperial River, which empties into the Pacific Ocean. This river system articulates a dense network of geological, ecological, and cultural memories. Along its course, the Cautín features sections of high ecological and cultural diversity and areas transformed by extractive activities, human settlements, and changes in land use that have altered the ecological and territorial balance of the basin. These interventions have left visible traces on the landscape: redefined edges and wetlands with reduced functionality.

The work arises within the framework of a formative process in architecture and landscape. From there, it explores how design can act in transformed territories, proposing actions capable of restoring their ecological and cultural integrity. Based on a critical territorial exploration, common patterns of deterioration were identified in different sections of the river. The methodology applied consisted of a qualitative study based on a 10-km stretch of the Cautín River, where ecological, cultural, and infrastructural phenomena were documented through graphic and analog records. This survey made it possible to identify, by contrast, repetitions and singularities throughout the river landscape. As part of this expanded reading, 44 aggregate extraction points—active or disused—were identified, an activity that, although latent in the everyday landscape, explains much of the fragmentation and systematic erosion of the riverbanks. Based on this analysis, a specific site was selected for the development of a rehabilitation project, located in an area where multiple layers of landscape transformation converge.
The project was developed in the municipality of Lautaro and addresses a site adjacent to the Isabel Riquelme Park Geosite, a Mapuche community, and the riverbank, where a degraded wetland and an eroded riverbank converge. The proposal consists of a design operation that, based on a strategic reorganization of the soil remnants altered by extraction, becomes a catalyst that provides the topographical conditions necessary for plant regeneration, favoring moisture retention and the emergence of pioneer microorganisms that stabilize the soil. This intervention is not limited to ecological regeneration. It also proposes the revival of an ancestral practice: the harvesting of native plants to produce essential oils for medicinal use. The landscape is thus configured as a living infrastructure, capable of sustaining ecological, cultural, and productive processes simultaneously.

The work proposes a methodology that can be replicated in other territories undergoing similar transformations, as it recognizes underlying but decisive variables in the way the landscape works. However, it is not limited to diagnosis: it proposes a response situated through design. The project does not seek to return the site to a previous condition, but rather to enable a new relationship between the river, its environment, and those who inhabit it.

LINKING WITH NATURAL AND CULTURAL HERITAGE, DEVELOPING NATURE INTERPRETATION TOURS TO BUILD THE DIVERSE AND COMPREHENSIVE ZHIJINDONG CAVE GLOBAL GEOPARK

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Keywords: Linkage with Natural and Cultural Heritage, geotourism, Sustainable Local Development

The Zhijindong Cave UNESCO Global Geopark is situated in Zhijin County, Bijie City, in Guizhou Province. It covers an area of 201.72 km². The Geopark is made up of three karst landform units: Zhijindong Cave, Qijiehe River, and Dongfenghu Lake. It showcases a typical plateau karst landscape characterized by caves, gorges, natural bridges, and Tiankengs, all of which are impressive in size, diverse in features, and visually stunning. Zhijindong Cave Geopark serves as an excellent location for examining the evolution of both surface and underground karst landforms.

Zhijindong Cave Global Geopark is a model for the integration of karst geological ecology and ethnic culture. The long history, rich human resources, and the perfect combination of ancient folk customs and nature, which constitutes a natural, beautiful and harmonious natural ecological environment in the Geopark.

Zhijindong Cave Global Geopark integrates geological, biological, and cultural heritage to highlight connections between geology, ecosystems, and human activities, helping visitors to understand better the human-nature relationship.

Zhijindong Cave Global Geopark develops nature interpretation tours linking geology and biology to give visitors a diverse and comprehensive experience throughout the entire UGGp area. We promote geotourism by integrating popular science, natural ecology and culture to achieve the sustainable development of the geopark.



GEOPARKS, CLIMATE CHANGE, GEO-HAZARDS RISK REDUCTION AND PUBLIC AWARENESS



MULTILATERAL FRAMEWORKS, GLOBAL POLICY AND LOCAL ACTION FOR NATURE

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Keywords: GBF, SDG, Paris Accords, geodiversity, UNESCO Global Geoparks

Ambitious global agreements and frameworks have been established to deliver sustainable development, action for ecosystems and biodiversity, as well as climate change mitigation and adaptation (GBF, SDG's, Paris Accords). Although some progress is being observed in these domains, one unexpected consequence of the different multilateral initiatives has been to increase the siloed approach to addressing global changes, for example, the move from the more generalised term, nature to the more specific notion, biodiversity. A shift that has been echoed in the language used by politicians and stakeholders where these terms are regularly used interchangeably. Elsewhere bodies position champion climate change as the pressing topic, whilst others assert that biodiversity is the key issue.

International bodies and commissions predominantly structure their efforts though highly targeted thematic actions, despite often being concerned by one or more planetary challenge. The systems approach naturally employed by geoscientists, given their ease at working in the past, present and future, as well as across all of nature's interacting cycles and processes, is of critical importance to the well-being of Earth and the success of human endeavours in the face of these multiple global challenges. Unsurprisingly, evidence is emerging that confirm the potential synergies of engaging in an integrated, holistic approach to the natural world that includes people, for example in the recent IPBES assessment report on biodiversity, water, food and health.

UNESCO Global Geoparks are living laboratories, territories that engage daily with communities to raise awareness to these global challenges and who experiment to deliver integrated local scale solutions. Experiences within the Chablais UNESCO Global Geopark show how local action not only contributes to global commitments in climate education, natural heritage management and protection, sustainable resource use, but also brings societal benefits. It has further demonstrated how capacity building with politicians and stakeholders is changing the use of language, and therefore action, around geodiversity, biodiversity, ecosystems and nature. Not only has the region tested the explicit use of promoting geodiversity as a critical component of nature, it has also used these actions as a platform for promoting transdisciplinary responses at a local level to the international agreements.

LEVERAGING NATURAL HERITAGE AS A CATALYST FOR COMMUNITY RESILIENCE LESSONS FROM THE RESILIAGE CORE LABS IN UNESCO GEOPARKS

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Keywords: heritage, community engagement, disaster risk reduction, resilience

The RESILIAGE Project *(Resilient Heritage for Sustainable Communities in Europe)* is a European Union funded Horizon Europe project (2023–2026) dedicated to strengthening community resilience through cultural and natural heritage and local knowledge. The project deploys five CORE Labs – Community-Oriented Resilience Environments – which act as living, participatory laboratories where local stakeholders, researchers, and authorities co-design and test resilience solutions directly within their territories. These labs serve as real-life experimentation hubs where ideas can be co-created, validated, and adapted to the specific socio-cultural and environmental contexts of each site. The oral presentation will focus on the actions of three CORE Labs – Crete, Naturtejo, and Famenne-Ardenne UNESCO Global Geoparks – each leveraging heritage assets, collective memory, and community networks to foster resilience to natural hazards and climate-related disruptions. During the session, the RESILIAGE Geopark team will showcase concrete examples and lessons learned from field activities, demonstrating how community-driven processes are shaping innovative tools and strategies in these regions.

The island of Crete is vulnerable to recurring seismic activity and related cascading risks such as tsunamis and structural damage. The Crete CORE Lab, coordinated by the University of Crete in partnership with local civil protection actors, applies “Active Memory” approaches that transform lived experiences and collective narratives of past disasters into actionable preparedness plans. This involves multi-stakeholder workshops that engage residents, emergency responders, educators, and municipal officials to map historical disaster knowledge, simulate earthquake response scenarios, and test risk communication strategies. The lab pilots digital storytelling tools and participatory mapping to ensure that traditional knowledge and scientific expertise jointly inform emergency planning. These approaches embed resilience not only into formal governance structures but also into everyday community life, strengthening social ties and preparedness at all levels. The Naturtejo Core Lab (Portugal) is situated within a UNESCO Global Geopark renowned for its geological and cultural heritage, the Naturtejo CORE Lab addresses slow-onset hazards such as droughts, wildfires, and depopulation pressures by focusing on social interconnections and cultural exchange. The lab fosters intergenerational learning by bringing together schools, heritage custodians, local businesses, and risk management authorities to explore how local traditions, land-use practices, and community networks can improve adaptation strategies. Initiatives include participatory risk perception surveys, community-driven scenario building for wildfire prevention, and testing non-digital resilience tools such as heritage walks and community games. By integrating cultural tourism, heritage preservation, and risk reduction, Naturtejo seeks to create a shared culture of resilience that strengthens the ties between isolated rural communities and local decision-making processes, thus ensuring sustainability and social cohesion.

Finally, the Famenne-Ardenne CORE Lab (Belgium) is operating in a cross-border UNESCO Global Geopark region characterized by increasing flood events and socio-economic vulnerabilities, the Famenne-Ardenne CORE Lab emphasizes inclusive recovery and preparedness. It ensures that diverse local voices—including marginalized groups and small businesses—are integrated into resilience planning. Activities include community assemblies, training for local leaders, and hands-on workshops promoting nature-based solutions for flood management, such as wetland restoration and the integration of heritage landscapes into risk mitigation efforts. The lab is developing digital dashboards for early warning dissemination and participatory decision-making exercises that align civil protection strategies with community values and cultural identity.

As an EU-funded project, RESILIAGE exemplifies a multi-layered, community-driven approach to resilience: leveraging collective memory (Crete), social connections and cultural exchange (Naturtejo), and inclusive recovery strategies (Famenne-Ardenne). By co-creating solutions that blend digital and non-digital innovations and rooting them in heritage and place-based knowledge, these CORE Labs provide scalable and adaptable models that enhance preparedness, adaptive capacity, and long-term recovery across European regions and beyond. Through recent workshops, field visits, and pilot activities, RESILIAGE demonstrates how locally driven heritage-led actions can shape broader resilience policies and tools for sustainable, resilient futures.

LIVING WITH EARTHQUAKES AND VOLCANOES: RISK EDUCATION AND PUBLIC ENGAGEMENT IN THE AZORES UNESCO GLOBAL GEOPARK

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Keywords: Geoeducation, geohazards, communication, resilience

Situated at the triple junction of the North American, Eurasian, and African tectonic plates, the Azores archipelago has experienced 26 volcanic eruptions and numerous intense seismic crises since its settlement in the 15th century. Over time these geological phenomena have shaped not only the landscapes but also the identity and resilience of local communities.

Recently, this geological vulnerability has again come into focus with two independent seismic-volcanic crises beginning in 2022 on São Jorge and Terceira islands. Although no eruptions have occurred, both events remain under close scientific monitoring. These crises have highlighted the region's geological complexity and the essential role of accessible science communication in fostering public awareness and preparedness.

In response, the Azores UNESCO Global Geopark (UGGp) has taken on a proactive role in risk education and community engagement. One of its most impactful initiatives is *Why Does the Earth Shake?*, which introduces key geodynamic concepts specific to the Azores, explains earthquake mechanisms, and promotes informed self-protection behaviors. This activity gained particular relevance on the affected islands, where demand rose following the onset of the crises. It is often complemented by additional resources, including *Volcanoes of the Azores* and *Natural Hazards in Portuguese Geoparks*, the latter developed in collaboration with the Portuguese Network of UGGp. Together, these initiatives have been instrumental in strengthening geohazard literacy across the community.

Outreach activities have also aligned with international campaigns such as World Civil Defence Day and International Day for Disaster Risk Reduction, including school-based earthquake drills. A notable example of local-level engagement was the collaboration with the Civil Protection Unit in Altares (Terceira Island) involving presentations and practical activities, for students and educators, on the ongoing crises and the Local Civil Protection Plan.

To broaden its outreach, the Geopark has reinforced digital communication, promoting the *AZORES QUAKE* mobile app which allows citizens to report felt earthquakes and access real-time information. The Geopark has also continued to disseminate risk prevention and self-protection content through local media, including the *(GEO)Diversidades* page in *Açoriano Oriental* newspaper and the *Geoparque Açores em 5 minutos* program on the regional radio station.

As part of its long-term commitment to the community, the Municipality of Angra do Heroísmo, in collaboration with the Geopark and CIVISA, is currently developing a new brochure focused on the Santa Bárbara Volcanic Complex, aiming to present volcanic and seismic risk information in an accessible, locally relevant format that supports effective preparedness behaviors. Through these integrated and evolving efforts, the Azores UGGp continues to demonstrate how geoparks can serve as platforms for territorial cohesion, science-based risk communication, and community resilience in geologically active regions.

DEVELOPING SCIENCE-POLICY INTERFACES TO SHARE WATER AND PRESERVE AQUATIC ENVIRONMENTS: FROM AQUIFERS IMAGINING TO SURVEY ON THE THERMAL REFUGES IN THE CHERAN RIVER (MASSIF DES BAUGES UGGP)

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The accelerating effects of climate change in the Alps have led the Massif des Bauges Geopark to play a greater role in the difficult issue of water sharing. In the past, water was present and available all year round, meeting the demands of local activities and ensuring the proper functioning of ecosystems. The change in rainfall patterns is leading to more severe and longer low-water periods. The result is a reduction in the volume of snow, which previously used to store water efficiently before releasing it back into the environment and aquifers in spring and summer. Higher temperatures and longer periods of drought have an impact on agriculture, forestry and the ecological status of rivers and wetlands. This issue is now an integral part of the new Geopark Charter, the guiding and planning tool for Geopark policy over the next 15 years. This strategy also aims to preserve our national "wild river" label, from which the Chéran benefits.

Continuing the engaged work on water resources, the Geopark is therefore deploying a strategy based on the concept of Science-Policy Interface (SPI) through the design of tools allowing both to enhance the knowledge of the resource and to raise awareness among residents and elected representatives of the reality of the resource and the impacts of climate change. Two of these tools are presented herein:

A range of presentations designed to share our knowledge of water resources, produced as part of conferences and educational tools. The aim is to present the nature and functioning of our aquifers as clearly as possible. Local representations are more likely to interest the public, who can then project themselves more easily. 3D representations, animated diagrams and videos are just some of the ways in which the issue of water can be approached in an attractive way. Particular attention is paid to highlighting interactions with agriculture and forestry.- An innovative study on the thermal refuges of the Chéran river, using airborne infrared thermal mapping. It provides accurate data and representations of river functioning, and especially detailed representation of warming and cooling zones that can have an impact on fish populations. It is a decision-making tool that we hope will help protect the vitality of our aquatic environments. The aim of this action is to mobilize citizens to help implement the best possible adaptation, between changes in practices and optimal management of the resource. This study provides insights and understanding that can accelerate public awareness of resource management

By using such tools and studies, the global vision that the Geopark wishes to develop is to better share information in order to contribute to greater ownership and better coordination of actions to satisfy and, if necessary, arbitrate between water uses.

ACTIVITIES OF CROSSBORDER KARAWANKEN-KARAVANKE UNESCO GLOBAL GEOPARK FOR DISASTER RISK REDUCTION AND CLIMATE CHANGE ADAPTATION

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Keywords: Geopark Karawanken-Karavanke, KaraMon, WATERWISE

Karawanken-Karavanke UNESCO Global Geopark is crossborder geopark, connected and divided by the mountain range of the same name. It is located along the border of Austria and Slovenia and is marked by the wide geological variety between the Alps and Dinarides.

In the last ten years, the entire Geopark area has been severely affected by high winds, freezing rain, extensive landslides and heavy rainfall combined with 100-year floods, most recently in August 2023. Within the INTERREG SI-AT project KaraMON: Improving resilience to natural disasters in the Geopark Karavanke through the development of a common digital network for monitoring, communication, prevention and intervention, risk assessment, based on scientifically and professionally upgraded modeling will be improved, strengthen disaster communication and thus bilateral assistance, including early identification of crisis situations, and the development of response and assistance protocols, including an overall concept for better bilateral natural disaster intervention. The KaraMon project aims both to prevent the consequences of extreme weather events through risk assessment, and to respond more effectively in extreme weather events through the targeted strengthening of resources in fire departments on both side of the border.

On the other hand, extreme weather events, together with rising temperatures, threaten streams and groundwater in the wider alpine region. These changes impact biodiversity and affect agriculture, water supply, and also tourism. These issues are addresses within the WATERWISE project: Co-designing sustainable management solutions for resilient Alpine headwaters, implemented in the frame of the INTERREG Alpine Space programme. The three-year WATERWISE project involves 12 project partners from 6 countries (Austria, France, Italy, Germany, Slovenia, Switzerland) under the leadership of the University of Neuchâtel (CH). The aim of the project is to support effective adaptation and management plans for mountain headwaters with greater availability of environmental information, new open source socio-hydrological headwater models for six pilot areas, and enhanced information transfer between science and policy. The models will serve to assess hydrological vulnerability for better adaptation to climate change and water use in this still poorly researched parts of alpine areas. By developing affordable meters for monitoring the waters and ecosystem services, and introducing numerical tools the coordination of water management plans along river basins and across borders will be improved. Combined with educational materials, creative storytelling and public outreach events, the results of WATERWISE project will raise awareness among Alpine communities about the vulnerability of headwaters ecosystem services. WATERWISE project will strengthen the dialogue between scientific experts and policymakers and stimulate the joint development of transnational solutions to secure water resources in the entire Alpine region.

USING GOATS AND DIGITAL TECHNOLOGY TO REDUCE VEGETATION AND INCREASE PUBLIC AWARENESS

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Keywords: climate change, public awareness, sustainable development, environmental action

Climate change and changes in agricultural practices have transformed parts of the landscape in Magma Geopark. Over the past 50 years, bare mountains and hills have gradually turned into forests—covered with trees and other vegetation.

In collaboration with the Norwegian Environment Agency and sponsored by local businesses, Magma Geopark has engaged nature's own gardeners—goats—to graze the vegetation and keep it under control. The goats are from a local goat farmer, and we use No-Fence technology, i.e., digital fences. This makes it possible to monitor and control the goats even in urban areas.

Goals:

-reduce vegetation
-focus on the value of traditional agricultural practice
-focus on climate change consequences
-local value creation (tourism, new products)
-educational tool for schools and kindergartens

The project has broad engagement, and the goats are popular among both tourists and the local population. In addition, they should play a role in educational activities for schools and kindergartens.

The social enterprise Uninor is responsible for looking after the goats, providing meaningful work for its employees. Uninor is now planning to establish a small farm and also to offer rental No-Fence goats to landowners within Magma Geopark.

This project is a successful combination of public education, local involvement, environmental action, and local value creation.

HOW SHOULD WE RECORD AND TRANSMIT INFREQUENT LARGE DISASTER? -INSIGHT FROM THE 2024 NOTO PENINSULA EARTHQUAKE, JAPAN-

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Keywords: disaster resilience, disaster education, geo-hazards risk reduction

On 1 January 2024, the Noto Peninsula earthquake occurred with its epicentre in central Japan, causing 600 casualties (as of June 2025). Many geoparks are located around the epicentre, some in territories with significant damage from landslides, liquefaction and tsunamis. In areas without universities or research institutions, traces of damage caused by earthquakes often disappear or are repaired spontaneously, without academic investigation. However, documenting and passing on such disaster history is vital for improving disaster resilience.

Geopark management organizations, which conserve and utilize the geological resources of their territories for education and regional development, can be regarded as home doctors for regional geology. For this reason, we believe that we have a mission to proactively survey damage in the region to share with the local community. Itoigawa Geopark spent about a month, starting two days after the earthquake, surveying the damage in the territory. The results obtained from the survey were promptly reported at lectures for residents, and some were published in academic societies and journals. These efforts were broadcast by several Japanese media outlets.
Following a major disaster, misinformation is often spread via social media. Such uncertain information not only prevents affected residents from taking appropriate action, but can also create a psychological burden. However, affected areas are often preoccupied issuing disaster certificates and running evacuation centres that they are unable to verify that information released daily by research institutions is comprehensive and organized into information that is easy for residents to understand. Therefore, the Disaster Prevention Working Group of the Japan Geoparks Network, with the cooperation of members from unaffected areas, created a poster on the mechanisms of the earthquake and aftershocks. These posters allowed the affected areas to communicate accurate information to their residents. This proved useful for the affected areas and was a good practice of the functioning of the Geopark network.

The cycles of such major earthquakes are very long - several hundred years or more - and it is rare for a person to experience two in one lifetime. It is therefore important that knowledge and experiences of earthquakes are passed on to future generations. Therefore, on 1 September 2024 (Japan's Disaster Reduction Day), a joint statement was announced by the six Geoparks around the epicentre, and digital educational materials are currently being developed to teach about earthquake mechanisms and earthquake-related disasters using actual examples from the Noto Peninsula earthquake. We hope that this digital educational material will be used both within and outside the region and contribute to improving disaster resilience. This presentation will introduce our work to date and the digital educational materials in development.

HERITAGE AT RISK: CLIMATE CHANGE AND THE FUTURE OF GEOPARK GASTRONOMY IN ASO, JAPAN

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Keywords: climate change, public awareness, Geopark Gastronomy

In 2025, the UNESCO Global Geoparks Network launched the "Geopark Gastronomy Working Group." This initiative represents an approach that goes beyond the celebration of culinary heritage, engaging directly with SDG 13, "Climate Action." This presentation examines the case of Aso UNESCO Global Geopark (UGGp) in Japan, where climate change is visibly impacting regional food culture.

In its 2025 update of climate change scenarios, the Japan Meteorological Agency (JMA) reported that between 1898 and 2024, Japan's annual mean temperature increased by 1.40°C per century. The revised scenarios outline possible climate conditions in a world that meets the Paris Agreement's 2°C target and in a 4°C warming world without additional mitigation measures, with both projecting further temperature increases. Analysis of several decades of JMA data by Aso UGGp also confirms a steady rise in the region's annual mean temperature.

Interviews conducted by Aso UGGp, in collaboration with the National Park, reveal that local residents have noticed seasonal shifts. For example, the sowing of SOBA (buckwheat) is perceived to occur roughly a week earlier than before. Changes have also been reported in Aso TAKANA, a traditional leafy vegetable and regional specialty. Historically, heavy snowfall in the high-altitude caldera suppressed its growth, producing its distinctive pungency. In recent years, reduced snowfall has allowed the plants to grow larger, altering their traditional characteristics. These observed changes align with scientific data indicating a warming climate and demonstrate how agricultural products shaped by unique geological and climatic conditions are directly affected.

If these trends continue, traditional crops may become difficult to cultivate without significant changes in farming practices. This suggests that elements of Geopark Gastronomy currently taken for granted are, in fact, "heritage at risk" that should be recorded and preserved. However, public communication materials that link scientific climate data with observable local changes—and that emphasize the importance of both climate action and food heritage preservation—remain rare.

This presentation will outline the scientific and cultural connections between climate change and regional food heritage in Aso, and propose ideas for communication tools such as brochures, exhibition panels, and public outreach materials. These proposals aim to raise awareness of the urgency of documenting and safeguarding culinary traditions threatened by climate change. The session will invite participants to discuss the potential effectiveness, challenges, and broader applicability of such approaches within the Global Geopark Network.

COMMITMENT TO RESILIENCE: THE AZORES REGIONAL GOVERNMENT STRATEGIC SUPPORT TO AZORES UNESCO GLOBAL GEOPARK

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Keywords: governmental support, territorial resilience, climate change, geohazards

As an oceanic and volcanic UNESCO Global Geopark, the Azores faces the complex challenge of preserving its outstanding geological heritage while contributing to a more resilient territory and community through geohazard and climate change risk reduction. In response, the Regional Government of the Azores, through the Regional Secretariat for the Environment and Climate Action (SRAAC), has implemented a coordinated set of projects aimed at strengthening territorial resilience, science-based decision-making, and public engagement.

Key initiatives include AZMONIRISK, a project dedicated to monitoring areas susceptible to geological hazards across the archipelago, and the Flood Alert System for High-Risk River Basins, which enhances local early-warning and rapid response capacity. Coastal vulnerability is addressed through the Assessment of Coastal Flooding and Overtopping Risks, while the Flood Risk Management Plan of the Azores (PGRIA**)** provides a strategic framework for integrated risk governance.

Complementing these efforts, the Regional Programme for Climate Change (PRAC) and EU-funded projects such as LIFE IP CLIMAZ**,** PLANCLIMAC**,** and IMPLACOST support the development of adaptive strategies, interregional cooperation, and climate-resilient spatial planning. Notably, the production of high-resolution risk and vulnerability maps serve as a crucial communication tool, building bridges between scientific knowledge and communities through awareness and engagement activities.

In parallel, the Azores Geopark plays a key role in promoting environmental education and geoscience literacy**,** fostering a culture of risk awareness and sustainable development. Through school programs, awareness activities for local community, and interpretation of geosites, the Geopark contributes to strengthen local identity and empower communities to become active agents of resilience. Furthermore, the integration of scientific research into local narratives, supported by participatory methodologies, reinforces the Geopark as a dynamic interface between science, government, and society.

These achievements are reinforced by strong political commitment and institutional coordination at the regional government level, ensuring that policies align with scientific evidence and community needs. The initiatives referred, and the support of the Regional Government of the Azores to the UNESCO Global Geopark reflect the government's commitment to strengthen the role of the Azores Geopark as a living laboratory, where science, policy, and local knowledge converge to build a more sustainable and resilient territory.

CLIMATE CHANGE RESEARCH IN THE TORATAU AUGGP (RUSSIA)

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Keywords: climate change, geopark, Toratau, Russia

The Toratau aUGGp is located in the Republic of Bashkortostan (Russia). Since 2020, it has been conducting regular research on climate change, including the analysis of remote sensing data.

An analysis of meteorological data since 1961 has shown a steady increase in air temperature, which is evident in all months of the year. The rate of increase in cold-season temperatures is higher than in warm-season temperatures. The overall warming in the Geopark has led to an extention of the warm and growing periods, and summer season. The precipitation amount within the warm season tends to decrease, and the cold season shows increase in precipitation.

Geopark's decarbonization potential assessment and the adaptation of natural ecosystems to climate change – significant aspects of its program. An analysis of NDVI values and soil temperature revealed the highest dependence on soil temperature in forest ecosystems (R^2 = 50 or more), while steppe and agricultural lands show less dependence (R^2<30).

The most effective way in greenhouse gases sequestration – to use artificial and natural tree plantations. The tree canopy of the Toratau Geopark is represented by broad-leaved forests with linden trees predominance. These forests have important ecosystem significance as they provide food for the wild bees. Additionally, these forests have a high capacity for absorbing atmospheric carbon. The regression analysis showed a significant correlation between the AlOS Palsar pixel values and the tree stock, with a Pearson correlation coefficient of r = 0.62 and a determination coefficient of R^2 = 0.38. Tree growth from 2010 to 2023 assessment revealed an increase in the tree stock in the eastern part of the Toratau Geopark, with an average increase of 8-16 m^3 per hectare per year, which corresponds to approximately 6 tons of carbon per year per hectare. In general, the forests of the entire Geopark absorb about 62,000 tons of carbon per year.

An important role is given to education and awareness of climate change. Thematic classes are held for schoolchildren in the Geopark, and they take part in research activities. In particular, in assessing soil temperature.

This year, the Geopark opened the Climate House Museum, which provides an understanding of past and present climate, the rate of climate change, methods of studying past climate, the role of plants in the carbon cycle and climate change, the carbon footprint made by various economic sectors, and dangerous weather phenomena.

WHAT CHANGES WHEN THE CLIMATE CHANGES?

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Keywords: climate change, biodiversity, sustainability

Climate change is a global phenomenon with increasingly evident impacts at the local level. The Central Catalonia UNESCO Global Geopark offers a territorial lens through which to understand climate change, using geological, ecological, and cultural sites to illustrate how changing climate conditions affect ecosystems, human activities, and biodiversity.

Unlike natural climatic changes in the past, the current global warming is rapid and primarily driven by human activity, especially the burning of fossil fuels. This process releases greenhouse gases such as carbon dioxide, which trap heat in the atmosphere and contribute to a rise in global temperatures. These changes are already observable locally through more frequent natural disasters, shifts in flora and fauna, agricultural challenges, and decreasing water availability.

The Geopark provides evidence of past climate changes, such as the Pleistocene glaciations observed in the Toll Caves and the Eocene-Oligocene transition in the Costa de la Vila outcrop. Although these changes were significant, they occurred over long timescales, allowing ecosystems to adapt in some way. In contrast, the current climate change is happening at an unprecedented pace, threatening the adaptive capacity of many species.

Specific impacts on the region could include the disappearance of aquatic species from drying streams, the progressive decline of European Black Pine forests, and the vulnerability of traditional agriculture in the Bages area—particularly vineyards and olive groves. Moreover, the frequency and intensity of wildfires have increased, exacerbated by drought and the abandonment of traditional land management practices.

Addressing these challenges requires both global and local action. At the international level, reducing emissions and transitioning toward sustainable economic models is crucial. Locally and individually, lifestyle choices regarding food, mobility, consumption, and energy use can significantly influence environmental outcomes. The leaflet encourages a rethinking of the relationship between people and their environment, highlighting the deep interdependence between climate, natural systems, and human activity.

Ultimately, understanding climate change through the lens of one's landscape not only raises awareness but also inspires individual and collective action. The Geopark thus serves as an educational and transformative tool for addressing one of the most significant challenges of our time.

SITUATION OF THE VILCANOTA AND CARABAYA GLACIATED RANGES AND GLACIER-RELATED HAZARDS IN THE QUELCCAYA GLACIER GEOPARK AREA

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Keywords: climate change, glacier retreat, glacier-related hazards, Quelccaya Glacier Geopark

In the Peruvian Andes, alongside other key ecosystems, glaciers and glacial lakes play a fundamental role in water supply. Peru is home to 68% of the world's tropical glaciers. Due to climate change, in recent decades the country has lost approximately 56% of its glacier surface, representing the loss of critical freshwater reserves essential for the development of both regional areas and the nation as a whole. The Vilcanota and Carabaya mountain ranges, located within the Quelccaya Glacier Geopark, are no exception to this issue. Between 1962 and 2024, the Vilcanota range lost 58% of its glacier area, while the Carabaya range experienced a 79% reduction over the same period.

The progressive retreat of glaciers has led to the formation of lakes surrounded by steep and unstable moraines, such as Lake Upiscocha, located within the Quelccaya Glacier Geopark at an altitude of 4,547 meters. A combination of factors—including increasing water volume in the lake, steep slopes with hanging glaciers, and unstable morainic structures—has created a geomorphological setting prone to the generation of high-velocity debris flows. These conditions represent a growing threat with a high destructive potential downstream. Lake Upiscocha has multiple records of Glacial Lake Outburst Flood (GLOF). The most recent occurred on May 14, 2022, when a landslide of approximately two million cubic meters of rock material took place on the rear of the right flank of the lake basin. This mass movement impacted the lake directly, causing a sudden rise in water level and generating a wave that overtopped the crest of the natural dam by nearly two meters. Geological and environmental factors, including rock weathering and steep slopes shaped by glacial erosion were identified as the primary causes of this event. Later, on August 9 of the same year, another outburst occurred in the same sector of the right flank, producing a sudden increase in the flow of the Upismayo River and causing erosion on the outer slope of the natural dam.

Lake Upiscocha has been classified as the lake with the highest susceptibility and risk of outburst in Peru. This underscores the importance of continuous monitoring, the preparation of technical inspection reports, and the timely delivery of information to decision-makers. Such measures are essential to prioritize prevention actions, awareness-raising, and capacity building, as well as the construction of infrastructure to minimize risk.

CLIMATE CHANGE EDUCATION PRACTICES IN CHEONGSONG UNESCO GLOBAL GEOPARK

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Keywords: climate change, geoeducation, geohazards, geopark public awareness

As climate change intensifies, its impacts are becoming increasingly evident across diverse regions. In response, Cheongsong UNESCO Global Geopark, located in the Republic of Korea, is expanding its role through disaster response, climate and geohazard education, and active community engagement.

In March 2025, a large-scale wildfire broke out within the Geopark, causing significant damage to major geosites and forests, including Juwangsan Mountain and the Flower Stone Geo-trail. This disaster, driven by prolonged drought and strong winds—both linked to climate change—prompted an immediate response from Cheongsong County, including emergency logging, demolition of unsafe homes, and support for displaced residents. In parallel, the Geopark team launched collaborative educational and hands-on programs with local partners. All proceeds were donated to wildfire recovery efforts, creating opportunities for the public to better understand the connection between geohazards and geopark-based education.

Cheongsong also places emphasis on the impact of climate change on local agriculture. As Korea's leading apple-producing region, Cheongsong is facing the reality of shifting cultivation zones due to rising temperatures, which have resulted in tangible losses for farmers. In response, the Geopark has developed programs such as "Global Warming and Cheongsong Apples" and "The Cheongsong Apple, Mirroring the Earth's Interior", using apples as a familiar and symbolic medium to communicate climate science and Earth systems in an engaging and accessible way.

Another noteworthy example is the Sinseong-ri Dinosaur Footprint Site, a geological heritage site revealed by a landslide triggered by a powerful typhoon. This case highlights how climate-driven extreme weather events can uncover hidden geodiversity. The site is now actively integrated into the Geopark's educational and interpretive programs.

Looking ahead, Cheongsong Geopark plans to install interactive exhibits on climate change, wildfires, and geohazards at key visitor centers, while continuing to expand its geoeducation initiatives for diverse audiences.

By weaving together its natural landscapes, agricultural identity, and disaster experiences into comprehensive education, Cheongsong UNESCO Global Geopark is positioning itself as a practical and community-based model for climate-responsive geopark action.

BIOCHAR AS A WATER RETENTION MATERIAL FROM FAMILY FARMING WASTES TO MITIGATE ENVIRONMENTAL IMPACTS AROUND KÜTRALKURA GEOPARK

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Keywords: family farming, La Araucanía region, climate change, water retention, biochar

Agriculture is an extremely important activity for human development, providing goods and services. However, it impacts the environment through the intensive use of natural resources and biodiversity, and pressure on ecosystem services. Additionally, it is recognized as responsible for 30-40% of global greenhouse gas emissions and 80% of freshwater consumption, contributing to the intensification of climate change. In this context, family farming (FF) is notable for its poor waste and water management through the burning of its residues and for its lack of the necessary monetary resources to invest in efficient irrigation systems. This situation affects the perception of the FF, especially in the communities around Kütralkura Geopark. The Geopark is located in the Araucanía Region, where FF accounts for 32.3% of the area. Geopark's objective is to educate on topics related to sustainable development and climate change. Therefore, any sustainable practice that provides real-life educational experiences associated with countering the effects of climate change in these communities and, in turn, improving their image of sustainability would contribute to the Geopark's development. In this regard, Chile has set a goal of reducing freshwater consumption for agricultural activities by up to 60%. This leads to a series of short-term measures to promote investment and training in technical irrigation, increase awareness of water shortages, and promote information and technology transfer to water resource users.

One proposal by the UC Temuco research team is to produce different types of biochar from waste derived from these communities to be used as water-retaining materials. Thus, the main activities were focused on biochar production from waste produced by family farming, biochar characterization, and the measurement of theoretical water retention, as well as water release. Key results included obtaining two types of biochar: one from pruned forest trees and one from cherry and apple trees. These two types showed similar physical and chemical characteristics, such as alkalinity, granulometry, content of nutrients and carbon, and a tendency to attract water. However, both differed in electric conductivity values (0.76-3.1 dS/m). Theoretical water retention values showed that both biochars retain between 1.18 and 1.39 g of water per gram of biochar. The highest value was achieved by biochar, derived from the pyrolysis of forest tree pruning. Regarding water release tests, both biochars retain and release water, without losing their physical and chemical properties for at least five operating cycles, and both biochars were capable of releasing the retained water in 4 days, showing their potential as low-cost water retention materials for FF.

MUDEUNGSAN UGGP'S INITIATIVES TO ADDRESS CLIMATE CHANGE

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Keywords: Mudeungsan UGGp, SDG, climate change, Monitoring, Mudeungsan watermelon, Arboretum

Mudeungsan UNESCO Global Geopark (UGGp), spanning the regions of Gwangju Metropolitan City, Damyang-gun, and Hwasun-gun in South Korea, encompasses a rich variety of geological, ecological, historical, and cultural sites. Recognized as a UNESCO Global Geopark, Mudeungsan UGGp is dedicated to promoting sustainable development and actively contributes to achieving the United Nations Sustainable Development Goals (SDGs), with particular emphasis on SDG 13: Climate Action. The geological sites within the geopark are largely exposed to natural environmental conditions, making them highly vulnerable to the adverse effects of climate change. In order to minimize these impacts and preserve the integrity of these sites, Mudeungsan UGGp conducts systematic and ongoing monitoring. This monitoring is performed by trained geopark interpreters who regularly assess the current conditions, conservation status, and any visible environmental changes occurring at each geological location. A significant example of climate change impact is observed in the cultivation of the Mudeungsan watermelon, a traditional and unique fruit native exclusively to the foothills of Mudeungsan. Recent climate shifts have led to a noticeable reduction in both the cultivation area and production volume of this locally important crop. To counter these challenges, Mudeungsan UGGp supports scientific research and local initiatives aimed at developing sustainable agricultural practices that ensure the continued growth of this culturally significant fruit. Furthermore, the watermelon has been officially designated as a Geofood product, which helps raise awareness among visitors and supports local farmers by promoting the fruit as a unique regional specialty. In addition, the Gwangju City Arboretum, newly established within the geopark's boundaries near a municipal landfill site, serves multiple ecological and environmental purposes. The arboretum was designed to reduce pollution by utilizing vegetation to filter gases emitted from the landfill. It also functions as a sanctuary for native plant species whose habitats have been reduced due to climate change. Through activities such as collection, propagation, preservation, exhibition, and scientific research, the arboretum plays a vital role in conserving biodiversity and ensuring the sustainable use of these plant resources for future generations. Through these multifaceted efforts, Mudeungsan UGGp aims not only to mitigate the adverse impacts of climate change but also to fulfill its mission as a model UNESCO Global Geopark committed to environmental stewardship, education, and sustainable community development.

PROMOTING BAMBOO AS ECO-FRIENDLY SUBSTITUTE FOR PLASTICS IN XINGWEN UNESCO GLOBAL GEOPARK

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Keywords: Bamboo replacing plastic, climate change, environmental protection, Xingwen

Bamboo is a renewable green resource, which can be put into sustainable use once cultivated. It grows fast, maturing in three to five years, has a low production cost and offers outstanding carbon sequestration capacity. It also has other ecological values such as water conservation, preventing water seepage and soil erosion as well as purifying the air. Xingwen UNESCO Global Geopark has abundant bamboo resources and enormous potential for industrial development. There are more than 30 species of bamboo, covering an area of 36667 hectares, with annual production of 320,000 tons of bamboo materials in Xingwen County. Against the backdrop of global attention to climate change and environmental protection, and active responses to plastic pollution, the Geopark has vigorously promoted the initiative of replacing plastic with bamboo. At present, it has fostered 146 bamboo processing enterprises, forming a complete industrial chain with over 100 types of "bamboo replacing plastic" products. It is estimated that China's bamboo forests can reduce carbon emissions by 197 million tons and sequester 105 million tons of carbon annually, and the carbon emissions from bamboo processing are far lower than those from traditional materials. The practice of "replacing plastic with bamboo" in Xingwen UNESCO Global Geopark has made great contributions to global climate change and environmental protection, and also provided a replicable model for other regions.

CONTRIBUTION TO THE NEOTECTONIC STUDY AND RAISING AWARENESS ACTIVITIES IN THE LESVOS ISLAND UNESCO GLOBAL GEOPARK

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Keywords: seismic risk, geo-hazards, raising awareness, faults, neotectonics

Lesvos island, located on the Northeast Aegean region, Greece, is characterized by active tectonics associated with the evolution and deformation of the broader Northeast Aegean Sea.

The Northeast Aegean region is characterized by complex tectonics controlled by interplay of moving tectonic plates in the broader area. The area is affected by the dextral strike-slip movement of the North Anatolian fault, which ends in the Aegean basin and creates significant tectonic structures.

Several studies show that the region of the Northeast Aegean region is characterized by complex transtensional stress pattern due to the influence of the NAF, which in combination with the N-S extension stress field of the Aegean micro-plate, creates several secondary faults. Except from the well-developed NE-SW faults, the reflection profiles also show the existence of E-W and NW-SE oriented faults which were interpreted as Riedel fractures resulting from the transtensional character of the stress field.

Extensive field work was carried out for the study of tectonic structures in order to identify the tectonic deformation in the broader area, according to the new data.

Our study was based on the observations of the fresh road cuts created due to public works for the reconstruction of the new Kalloni – Sigri road where lots of new tectonic data were revealed.

The neotectonic evolution of Lesvos Island reflects the complex interplay of regional tectonic forces in the NE Aegean. The North Anatolian Fault (NAF), a major dextral strike-slip fault, exerts significant influence, generating numerous secondary strike-slip faults. Simultaneously, the general N-S extension of the Aegean microplate has led to the formation of large W-E trending normal faults. This interaction results in a transtensional stress field, producing a diverse array of tectonic structures.

The transtensional field of NE Aegean region is formed by the dextral strike-slip fault of NAF and its stress pattern creates a variety of secondary tectonic structures, such as secondary NW – SE strike-slip faults which are compatible with the active tectonics of the NE Aegean.

In addition to W-E normal faults and NE-SW dextral strike-slip faults, a secondary set of sinistral strike-slip faults has been identified. These faults, can now be considered potentially active structures within the broader stress regime.

Findings from this study further indicate that the island's extensive tectonic activity has played a crucial role in shaping significant geological formations, such as Voulgaris Gorge. The gorge, along with similar landforms, is likely the result of long-term fault activation and progressive deformation under the prevailing transtensional stress field. These observations highlight the dynamic nature of Lesvos' neotectonic landscape and its ongoing structural evolution.

The results of the neotectonic studies are used to explain the geotectonic evolution of the area to the broader public and to raise awareness on seismic hazard to the local communities through public lectures and educational activities organized by the Natural History Museum of the Lesvos Petrified Forest. Thus, the Lesvos UNESCO Global Geopark successfully raises awareness on earthquake hazard of the Lesvos island communities.

REMONSTAR – A PROJECT TO STUDY BIOLOGICAL RESPONSES TO CLIMATE AT ESTRELA GEOPARK (PORTUGAL)

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Keywords: biodiversity, climate, forest, park, research, shrublands

The Estrela UNESCO Global Geopark encompasses the highest mountain range in mainland Portugal, reaching an elevation of 1,993 metres. It features plateaus above 1,500 metres, deep valleys, and unique ecosystems of significant environmental interest. However, these ecosystems and their resilience in the face of ongoing global change remain poorly studied.

The ReMonStar project aims to establish a climate and biodiversity monitoring network in the Serra da Estrela to better understand the spatial heterogeneity of climatic conditions, biodiversity, and ecosystem functioning and regeneration. The network is being implemented on the upper plateau, which harbours unique ecological conditions in mainland Portugal, and in the Zêzere Valley, the largest and most significant glacial valley in the Estrela Mountain.

We have installed meteorological stations at both sites, along with cameras to monitor snow conditions and sensors to measure microclimate, and tree and shrub growth. In addition, remote sensing will be used to generate vegetation maps and monitor plant phenology.

The Zêzere Valley was severely affected by a major wildfire in 2022, and we are currently monitoring the regeneration of the burned areas, with a focus on the diversity of plants and fungi in the forest understorey. This research is essential for understanding the impact of global change on the region and can provide valuable guidance for the management of protected areas.

CHAITÉN ON-SITE MUSEUM: ADVANCES AND CHALLENGES IN PRESERVING GEOLOGICAL AND SOCIAL MEMORY AFTER THE 2008 ERUPTION

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Keywords Chaitén On-Site Museum, Patagonia Verde Geopark, geosite, community resilience, geoheritage

The Chaitén On-Site Museum, recognized as a geosite within the Patagonia Verde Geopark project, was established in the territory directly impacted by the 2008 eruption of the Chaitén volcano, one of the most significant geological events in recent decades in South America. This unique space in Latin America seeks to preserve and transmit the memory of a natural disaster that transformed the geography, social fabric, and daily lives of more than four thousand inhabitants, who today symbolize community resilience.

Since 2023, under the administration of the Foundation for the Sustainable Development of Patagonia (FUNDESPA), the museum has achieved important progress. Among these advances are the construction of a participatory museographic narrative that integrates community testimonies with scientific content; the implementation of educational activities for local schools; the collaboration with tourism operators who promote the museum as a cultural and natural experience; and partnerships with universities and researchers, positioning the museum as a regional reference in Earth sciences outreach and social memory.

Nevertheless, significant challenges remain. Ensuring financial and managerial sustainability is a priority, as well as expanding and diversifying interpretive infrastructure. Strengthening international cooperation networks and consolidating the museum as a strategic node within initiatives aimed at creating geoparks in Patagonia also represent central challenges.

The experience of the Chaitén On-Site Museum demonstrates how the community-based and scientific management of a heritage space can transform the memory of a disaster into a driver of education, research, and local development. Its trajectory and future projection make it a relevant case for the UNESCO Global Geoparks Network.

TEMPORAL AND SPATIAL CHARACTERIZATION OF THE BACKGROUND SEISMICITY AT LONQUIMAY VOLCANO, SOUTHERN CHILE

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Keywords: volcano monitoring, volcano forecasting, data analysis

The Lonquimay volcano is a stratovolcano located in the Araucania region in Southern Chile, part of the Kutralkura Geopark. Its eruptive record includes three events in the 20th century (1933, 1940 and 1988-90), which were characterized mainly by andesitic lava effusion but also by the creation of a pyroclastic cone during the last eruption. Despite the limited activity in the historical record, the volcano ranks in the 11th position in the Chilean ranking of specific risk index, created by SERNAGEOMIN. Given the last eruption was approximately 40 years ago, i.e. the same repose period for the last two eruptions, the assessment of the volcanic activity and the establishment of the seismic basal level can bring an important input for the characterization of a new unrest episode in the near future.

We study the occurrence of 124 seismic events related to rock failure and 51 related to fluid movements observed during 2024-2025. The locations obtained by SERNAGEOMIN point to active tectonic structures in the neighboring areas of the edifice that activate during the background volcano-tectonic activity of the system. In addition, limited temporal concentration of activity occurred in two epochs during the period of study, delimiting sudden activation of particular structures due to static stress triggering. The characterization of the b-value, provide information about the lack of fluids involved in the rupture process, indicating no magma migration but only tectonic forces being applied.

Overall, there are no indications that an escalation in the seismic or volcanic activity is imminent; however, by characterizing the background seismicity of the volcano we can track slight deviations from this state as early precursors of unrest or imminent eruption.

PREDICTION OF DAILY WEATHER-FIRE STATES USING MARKOVIAN CHAINS TO ASSESS RISKS IN THE KÜTRALKURA UNESCO GEOPARK, CHILE

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Keywords: Markov chains, fire risk, wildfires, climate change, Kütralkura Geopark.

Climate change is a global reality, with consequences such as rising temperatures and extreme droughts or floods. Extraordinary heat and drought conditions play a crucial role in the dynamics of wildfires occurrence. These fires cause environmental, economic, and social consequences. Particularly, in southern Chile, these fires threaten the biological and cultural heritage protected by the Kütralkura Global Geopark. Therefore, their prevention and control are highly relevant. In addition to this, technological and research advances have generated new data and tools to aid in the monitoring, forecasting, and mitigation of disasters. Based on this premise, a discrete-time Markov chain is developed to estimate the daily probability of transitioning from one state to another in the Kütralkura Geopark. To do so, the following variables were considered: surface temperature ≥ 18 °C, wind speed ≥ 3.5 m s^{-1}, soil moisture ≥ 65%, and recorded occurrence of wildfires. Each factor was coded as one if present under the defined conditions and zero otherwise. This led to the establishment of 16 states with fire-climate condition combinations. The daily time series used were compiled from CONAF's historical fire database and from the freely accessible NASA POWER archive. The period considered is 15 years, eliminating information from days from April 15 to August 14 of each year, as these correspond to the winter season (low temperatures and rainfall). Following a review of the tabulated data, those states never observed were eliminated. This generated a one-step, irreducible, and aperiodic transition matrix with 12 states; and the steady-state probabilities, mean first-pass time, and mean recurrence time were estimated. As an example, the probability of being in State 0 (temperature less than 18°C, wind speed less than 3.5 m s^{-1}, humidity less than 65%, and no fire) was determined to be 28.15%. For states with fire, the state with the highest probability is State 9 (temperature greater than 18°C, wind speed less than 3.5 m s^{-1}, humidity less than 65%, and fire) with a value of 4.39%. Furthermore, the average time from State 0 to State 8 (temperature less than 18°C, wind speed less than 3.5 m s^{-1}, humidity less than 65%, and fire) is 328 days; while the average time to return to State 0 is 3.55 days.

Since the variables are free and updated daily, and since the model is built for a specific environment (geopark area), it can be used to inform decision-making regarding early warnings and visitor advisories. Furthermore, the model can be refined by incorporating more robust variables or data.

FROM THE ZÊZERE RIVER TO THE TAP

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Keywords: conservation, monitoring, citizen science, education

With droughts becoming increasingly frequent in Portugal, it is more important than ever to ensure water efficiency across all uses and processes. This begins with raising awareness about the need to protect the natural environment, which is the source of the water that flows from our taps.

Riparian areas play a vital role in water resource management. These zones support key ecosystems that provide numerous benefits, including improving water quality, mitigating the impacts of floods and droughts, promoting biodiversity in and around rivers, enhancing the scenic value of the landscape, and attracting people to enjoy these natural environments.

Serra da Estrela, the highest mountain in mainland Portugal, has distinctive climatic, geological and geomorphological features that directly influence the regional hydrological cycle and the availability of high-quality water resources. These resources also have significant economic value. The region was described by the geographer Orlando Ribeiro as the "Water Castle of Portugal" because it feeds major river basins such as the Tagus, through the Zêzere River, and the Mondego.

In response to these challenges, the Estrela UNESCO Global Geopark and the Municipality of Manteigas launched the project "From Zêzere to the Tap". The goal is to explore strategies for reducing and mitigating water scarcity upstream, with a focus on actions that lead to more sustainable management and use of water. The project promotes the restoration of ecosystems and improvements in water use efficiency as key guiding principles.

Using the municipality of Manteigas as a pilot area, the project aims to raise awareness and engage the local community in preserving, restoring and valuing the Zêzere River. It also encourages the adoption of more sustainable behaviours that contribute to reducing household water consumption.

Small daily habits, when changed collectively, can have a meaningful impact on the future of water security in Portugal.

LEARNING FROM THE 2016 KUMAMOTO EARTHQUAKES: INSIGHTS FROM DISASTER MUSEUM KIOKU'S INTERACTIVE EXHIBIT

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Keywords: geohazard, earthquake museum, mitigation, disaster relics

In Kumamoto Prefecture, where the Aso Geopark is located, two major earthquakes struck on 14 and 16 April 2016 (M6.5 and M7.3), with a maximum seismic intensity of 7 (JMA scale). Across the prefecture, a peak of 183,882 residents evacuated, and numerous shelters were opened within the Geopark area. In 2023, Kumamoto Prefecture opened the Earthquake Museum KIOKU, which presents not only the mechanisms of earthquakes but also the tense hours immediately after the event, the realities of prolonged life in evacuation shelters, and practical ways to prepare during "normal" times. The exhibition culminates in an interactive wall where visitors leave short messages on sticky notes.

In this presentation, we report a pilot analysis of these messages using OCR and ChatGPT5 to examine the museum's impact on visitors. From approximately 300 comments, we identified 79 containing positive words or sentiments (e.g., "thank you," "ganbare/keep going"), only 1 containing negative wording, and many expressing learning and preparedness (e.g., "I learned a lot," "I want to be ready"). These results suggest that the museum experience tends to encourage and educate visitors rather than amplify fear. And while Japanese-language comments predominate, contributions in Chinese, Korean, French, and other languages were also recorded, reaffirming the museum's international reach and significance. Building on these findings, we aim to foster discussion about the preservation and interpretation of earthquake relics within geoparks and the evolving role of disaster museums in risk communication, memory, and preparedness.

BUILDING RESILIENT COMMUNITIES: INTEGRATED "MONITORING-EARLY WARNING-EDUCATION" MODEL FOR LANDSLIDE RISK GOVERNANCE IN QINLING ZHONGNANSHAN UNESCO GLOBAL GEOPARK

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Keywords: Qinling Zhongnanshan, resilient communities, landslide risk co-governance, Monitoring-Early Warning-Education system, heritage site protection

The Lishan landslide within the Qinling Zhongnanshan UNESCO Global Geopark, as a critical geoheritage site, poses direct threats to the Huaqing Palace cultural heritage and surrounding community safety. Innovatively establishing a "monitoring-early warning-education" multi-tiered protection system, the Geopark implemented an automated monitoring system in 2012 and upgraded to an adaptive monitoring network in 2022, achieving 24/7 risk awareness. By integrating manual inspections with smart sensing technologies, we captured key deformation trends along the northern marginal fault zone, enabling timely warnings for risks triggered by extreme weather and human activities.

Concurrently, community disaster prevention programs have forged an integrated "early warning-public education" conservation model. This initiative provides both technical reference and community engagement templates for global geoparks in disaster risk management.

TOOLS FOR THE MANAGEMENT AND PLANNING OF THE LANDSCAPE AND AGRICULTURAL SPACES OF THE ORÍGENS GEOPARK

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Keywords: landscape, conservation, renewable energies, mapping, Orígens UGGp

The climate emergency we are facing needs to be addressed as soon as possible. The response given to this issue has been a significant and rapid increase on the generation of energy from renewable sources. This situation has triggered rural areas, such as the Orígens UNESCO Global Geopark, that have received many applications for the implementation of macro-projects of renewable energies in its territory. Specifically, the proposed solar farms cover an area of 600 ha concentrated in an east-west strip of the central part of the Geopark. The lack of planning that regulates this type of activity in rural areas turns these projects into a risk for valuable territories and their sustainable local development. In addition, they influence and promote the loss of identity and the devaluation of territories.

The Orígens UGGp, located in the northeast of Spain in the province of Lleida in Catalonia, is made up of 19 municipalities with 16,143 inhabitants. Its territory has a population density of 8 inhabitants/km^2. However, 13 of the 19 municipalities have less than 5 inhabitants/km^2. The demographic development over the last 50 years has been characterized by a decreasing population.

The Geopark, at the request of its general assembly members, commissioned a study to develop and propose a series of guidelines for the landscape and agricultural spaces preservation. This study establishes the criteria for evaluating new projects and in this way regulate the changes and potential impacts, with the objective to prevent negative effects that may compromise the territory sustainable development. The study characterized the Geopark territory according to landscapes to be protected and managed and identified highly anthropized or degraded areas as priority areas for the development of new activities with high landscape impact. Two criteria were established for areas to be protected, while 35 criteria focused on the regulation of areas to be managed.

This study was approved by the Geopark general assembly in 2022 and is the basis of local planning since the municipalities of the territory incorporate it into their planning regulations. In addition, to help on the implementation of these criteria, the Geopark created an online viewer directed to municipality and County Council staff. This viewer makes available the necessary layers of information and elements to evaluate objectively new development projects or building permits requested in their demarcation. It includes: digital maps of the Geopark inventories; thematic maps resulting from the study of landscape protection and management; regional planning datasets; areas characterized as natural protected spaces; landscape characterization units; threatened habitats; urban planning and land registry datasets, as well as reference topographic and orthophotography maps.

MOVEMENT.AT – THE MOVING MOUNTAINS

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Keywords: Austria, geohazards, landslides, public awareness, virtual reality

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

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

The movemont.at project will be organized into five strongly interlinked work packages, each of them associated to one of the objectives. It will be implemented by an interdisciplinary team of scientists of the University of Graz and the University of Salzburg, and environmental education specialists from the three involved UNESCO Global Geoparks. The project will be embedded into the international research and geopark landscapes through various collaborations. First steps have been presented at the GGN conference in Marocco. With this oral presentation we can highlight first interdisciplinary outcomes relevant for other mountainous UGGp.

PHOTOGRAPHIC MONITORING OF LANDSCAPE EVOLUTIONS IN CLIMATE CHANGE CONTEXT: HAUTE-PROVENCE UGG CASE STUDY

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Keywords: landscapes, climate change, photographic landscape observatory, Haute-Provence

In 2024, the Haute-Provence UNESCO Global Geopark initiated a photographic landscape observatory on its territory, with the aim of monitoring their evolution in a context of climate change.

The photographic landscape observatories were created in 1989, at the initiative of the French Ministry of Environnement. At this time, the photography was no longer considered solely as a communication tool, but became a medium serving the knowledge of territories, particularly in the context of planning practices. The initial objective, innovative for the time, was as follows : take pictures of a territory and repeat them regularly over time, in order to monitor changes linked to the consequences of human actions on the landscape. Since 1990's, many photographic observatories were created on French territory, most often supported by regional natural parks.

In the Haute-Provence Geopark, it was decided to focus the observatory on the theme of the consequences of the climate change on landscape evolutions. As various reports and scientific studies show, mountain territories and environments are warming twice as fast as other ecosystems, with consequences on many levels (water resources, natural hazards, tourism, pastoralism, etc.). Moreover, the Mediterranean region is also one of the most affected by the impact of climate change. The Haute-Provence Geopark, a land of transition between Provence and Alps, is therefore directly affected by these phenomena, the repercussions of which will be visible in the landscapes.
The photographic landscape observatory will be conducted across the entire territory of the Geopark (more than 2.000 square kilometers and 67 municipalities concerned).
From a methodological point of view, six themes were chosen to illustrate different issues of the territory : water resources, snow cover, vegetation, agriculture, natural hazards and tourism. It was decided to carry out photographic campaigns in autumn and spring, in order to better illustrate certain issues linked to seasonality and its future disruptions (water level and flow, snow cover, phenology, tourism and agricultural activity, etc.). Finally, the renewal of the photographs of each site will take place every 4 years.
The first two photo campaigns were carried out in autumn 2024 and spring 2025. In total, more than 300 photographs were analyzed and 55 sites were selected to be integrated into the observatory (20 in autumn and 35 in spring). All results related to these campaigns will be presented at the 11th International Conference on UNESCO Global Geoparks.

With this project, which will be continued in the coming years, the Haute-Provence Geopark hopes to be able to document the consequences of climate change on local landscapes and thus, use this knowledge to raise awareness among local populations and help local authorities decide on specific policies to mitigate and adapt to climate change.

HARNESSING THE SOCIAL AND SOLIDARITY ECONOMY AS A STRATEGIC APPROACH TO COMBAT CLIMATE CHANGE: INSIGHTS FROM THE M'GOUN UNESCO GLOBAL GEOPARK IN THE BENI MELLAL KHENIFRA REGION OF MOROCCO

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Keywords: social and solidarity economy, climate change, M'GOUN UNESCO Global Geopark

This study examines the critical role of the social and solidarity economy (SSE) in promoting sustainable development within the M'goun UNESCO Global Geopark territory, particularly in the context of climate change challenges. The analysis reveals a remarkable increase in cooperatives, from just 9 in 2015 to 377 in 2022, representing a staggering growth rate of 4089% and involving 2,484 members. This surge indicates significant community mobilization and resource engagement.

Sectoral diversification within the SSE is noteworthy, with agriculture comprising 57.3% and crafts 16.4% of cooperative activities. This diversification reflects adaptive strategies to climate change, as sustainable agricultural practices and traditional crafts enhance local livelihoods while contributing to environmental conservation.

However, the study also highlights persistent territorial disparities, with poverty rates varying dramatically from 3.10% to 78.40% across communes. High illiteracy (54.99%) and unemployment rates (45.56%) contrast sharply with educational progress, particularly a 97.98% enrolment rate for girls aged 7 to 12. These disparities underscore the need for targeted interventions to address socio-economic inequalities that limit the SSE's potential.

The findings suggest that the SSE can serve as an effective climate adaptation strategy, but improving socio-economic indicators is essential for ensuring equitable benefits. The research advocates for collaborative partnerships among SSE actors, researchers, and decision-makers to co-develop local adaptation strategies.

In conclusion, the M'goun UNESCO Global Geopark has the potential to become a model of social and environmental innovation in addressing climate change. By leveraging the strengths of the SSE, the region can tackle immediate climate challenges while fostering a more sustainable and equitable future. This study calls for investment in the SSE as a transformative force for climate adaptation and socio-economic development in the Mgoun Geopark and beyond.

NATURE-BASED SOLUTIONS AS A STRATEGIC TOOL FOR CLIMATE ACTION AND RESILIENCE IN UNESCO GLOBAL GEOPARKS

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Keywords: Nature-based Solutions, UNESCO Global Geoparks, Climate change, IUCN Global Standard, Resilient communities

Nature-based Solutions (NbS) have gained international momentum as cost-effective and sustainable responses to global challenges, including biodiversity loss and climate change. In UNESCO Global Geoparks, territories dedicated to the protection of geological heritage and sustainable development, NbS offer a practical, science-based approach to enhance ecosystem resilience, support climate adaptation, and engage communities in transformative environmental management.

NbS interventions can simultaneously address several societal challenges, including climate adaptation and disaster risk reduction, while also supporting biodiversity benefits and human well-being. Actions such as reforestation, slope stabilization, wetland restoration, and integrated watershed management contribute to the restoration of ecosystem functions and the provision of vital ecosystem services, strengthening the capacity of local communities to adapt to climate change.

The IUCN Global Standard for Nature-based Solutions is a robust framework, with eight criteria and 28 indicators, that provides an integrative tool for the design, implementation, assessment and monitoring of NbS. Applying this standard within UNESCO Global Geoparks contexts ensures that NbS interventions are inclusive, rights-based, measurable, and aligned with conservation and development goals.

By integrating NbS into their management frameworks, UNESCO Global Geoparks have the opportunity to serve as living laboratories that promote ecological integrity and social resilience. Through participatory approaches that integrate scientific expertise with traditional and local knowledge, UNESCO Global Geoparks can foster inclusive governance, empower communities, and advance equity in environmental decision-making. This integrated approach not only reinforces territorial and community resilience but also contributes to the global agenda for sustainable and climate-resilient development.

WATER HERITAGE AND RESOURCES IN THE ATLANTIC GEOPARK PROJECT, CENTRAL PORTUGAL

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Keywords: geoheritage, climate change, Atlantic Geopark Project, route of the Water

The rocks that sculpt the territory of the Atlantic Geopark Project (AGP) region (Central Portugal) have a long history of more than 600 million years. This encompasses an impressive geodiversity that is materialized in a unique way in its landscapes, geological resources, and in the interaction with the culture of its inhabitants.
The geological record of this territory covers a wide range of geological time, from the Neoproterozoic until the Holocene. In effect, it is one of the most geodiverse areas of Portugal, which covers the opening and closing of the Rheic Ocean, the formation and break-up of the Pangea, and the opening of the North Atlantic Ocean. The geologic record preserves many of the processes subjacent to these geological events, in different magnitudes and occurrences. Some of these are already designated of international relevance as the Bajocian GSSP or the Bathonian ASSP, both in the Middle Jurassic that crops out in the Figueira da Foz municipality.

With the encouragement and active involvement of the Local Action Group AD ELO, recently was done an exhaustive inventory of the geoheritage of the six municipalities involved in this project: Cantanhede, Figueira da Foz, Mealhada, Mira, Montemor-o-Velho and Penacova. Furthermore, this territory corresponds to a coherent geographical unit that has strong institutional, economic and cultural ties beside the international geological heritage.

Water is considered a non-renewable natural resource, under extreme threat due to the demands of a growing population, agriculture, and industry, and the worsening impacts associated with climate change. This reality is largely the result of disturbances introduced by the action of human beings in the hydrological cycle. The use of water by man is of the utmost importance, therefore, the occupation of territory and the installation of human communities has always been conditioned by this resource.
The AGP territory is rich and diverse in terms of water resources, with rivers, springs, fountains, wells, spas, irrigation canals, ponds, waterfalls, and even flood plains, which turns it into a true living laboratory for understanding this reality. One of the initiatives to promote and consolidate the AGP consisted into create two main georoutes in the territory, the “Route of the Rock” and the “Route of the Water”. The “Route of the Water” comprise two complementary routes with 53 hydrological sites (water - 34 sites and beaches - 19 sites).
Based on the past developed fieldwork six sites were selected, one per municipality, to show the importance of the water in the territory of the Atlantic Geopark Project (AGP): Ançã spring, Morraceira Island, SPA of Luso, Barrinha de Mira, Paul do Taipal and Penacova spring.

