15th EUROPEAN GEOPARKS CONFERENCE

Natural Park Sierra Norte de Sevilla

UNESCO Global Geopark

Geoparks: memory of Earth, future for People

ABSTRACTS BOOK

JUNTA DE ANDALUCIA
CONSEJERÍA DE AGRICULTURA, GANADERÍA, PESCA Y DESARROLLO SOSTENIBLE

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WELCOMES & KEY NOTES

Welcome by Kristin Rangnes, Coordinator of the European Geoparks Network

European Geoparks Network, this very active regional network under Global Geoparks Network, is a fast growing "family" – a family of geopark delegates meeting regularly, in order to work together, improve and develop into the future. A future that we share with common generations and we know that will be with several challenges. The geopark ideas, the geopark philosophy about conservation, education, communication and sustainable development are driving forces that we all strive to achieve. Proud to be part of the UNESCO Global Geoparks since 2015 EGN has adapted to important rules of operations and guidelines, following the main basic ideas and looking into the future and wot welcome new European territories as part of our family.

EGN, from the creation in 2000 as the first geopark network, has grown from four founding members to this huge group of territories sharing the same values. Next year we will celebrate our 20th anniversary reminding us about our history, our present situation and preparing for the future. A future that thematically is represented by all the 17 Sustainable Development Goals. We will also need to discuss how to keep our family spirit, how to maintain our important active cooperation that our network is carrying out. But reflecting how a family functions we will manage; this conference is a proof, a sign, a token – on how we work together, meet, discuss, share and develop – together we can reach our goals for a common future.

15th European Geoparks Conference
Wednesday 25 September

Sierra Norte de Sevilla Geopark, Sevilla
Opening statement UNESCO – Kristof Vandenberghe

UNESCO is the UN Organisation with a mandate in Education, Science, Culture, Communication and Information. Besides the World Heritage Convention (1972), and the Biosphere Reserves (Mand and the Biosphere Programme, (1970) its General Conference adopted the UNESCO Global Geoparks when it merged into the International Geospcience and Geoparks Programme in 2015.

Since the UNESCO Geoparks were formally adopted by the General Conference of UNESCO, the programme has received an increasing support, a high visibility and a growing interest, in particular in those parts of the planet where the concept is less known.

While all sites respond to a common set of guidelines and criteria, there remains a large degree of freedom and flexibility to set out your own pathway, and to build your own Geopark, and there remains a large space for creativity, to shape the Geoparks along this concept.

This has led to a large variety of Geoparks, but all are recognized at the highest levels of government, as vehicles through which we promote and support sustainable local development, and ensure the protection of our unique geological heritage. The theme of this conference "Geoparks: Earth Memory, People Future" captures the essence very eloquently. Geoparks are about people.

There is a strong drive to expand the family and a constructive attitude to uphold the high quality of the Geoparks. UNESCO is delighted with this significant interest and is committed to providing its full support to seize this momentum, together with the Global Geoparks Network and the Geoparks Community, with donors and partners.

A last point I wanted to make is the importance of a better Geographical distribution of the Geoparks Network worldwide. We have been successful in Latin America over the last couple of years and can count on 7 UNESCO Global Geoparks on the continent, mainly due to a better promotion campaign and capacity building events. But the blind spot in Africa becomes hard to justify. We are strongly committed to raise funds for similar events, in particular in Sub-Saharan Africa, to promote the programme, together with the GGN experts, to build a better knowledge and target specific experts, communities and existing management structures.

So the work is not done yet, but I believe that there is a strong willingness to join efforts towards a successful further development, and UNESCO is glad to contribute to that. With its longstanding expertise and relying on one of the largest networks amongst the Geoparks Community, this European Geoparks Conference is a good opportunity to reflect on the technical aspects of Geoparks, but also to consider how to ensure the future sustainability of the Geopark concept in light of a fast expanding network. I hope this conference offers the venue through which to reinforce our standards, through peer-to-peer interaction, exchange of good practices and learning from each other.

THE GLOBAL GEOPARKS NETWORK: Challenges and future perspectives

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Keywords*:* Global, Geoparks, Network, UNESCO

The Global Geoparks Network (GGN) established in 2004, under the umbrella of UNESCO, as an international network, which provides a platform of cooperation among Geoparks. The GGN consists a unique worldwide partnership including 147 Geoparks working to protect geological heritage and promote local sustainable development.

The GGN mission is to influence, encourage and assist local societies all over the world to conserve the integrity and diversity of abiotic and biotic nature, to ensure that any use of natural resources is equitable and sustainable and to support economic and cultural development of local communities through the valorization of their unique heritage and identity.

In 2014 after one decade of successful operation as a volunteer network the GGN gained legal personality. The GGN General Assembly during the 6th Geoparks Conference in Saint John, Canada agreed to became an international non-profit association.

The GGN General Assembly is the Networks legislative body and the elected GGN Executive Board the managing body of the association in between two ordinary General Assemblies.

Global Geopark activities have been part of the UNESCO work plan since 2001 and, since 2004, UNESCO has offered ad-hoc support to Global Geoparks upon requests from individual Member States. In 2015 the 38th UNESCO General Conference ratified the statutes of the new 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 the criteria set by the above mentioned guidelines. In doing so, the GGN became officially the partner of UNESCO for the operation of the UNESCO Global Geoparks programme. GGN has a seat in the programme's structure as well as an important role and specific duties on the Geoparks evaluation and revalidation process.

The GGN organizes co-operation and mutual assistance between the UNESCO Global Geoparks and the Global Geopark professionals to develop and promote the Geopark concept world-wide.

The GGN initiates and co-ordinates Regional Geoparks Networks which enhance international co-operation in Geoparks building and management, supporting local communities and fostering local development. The GGN includes the European Geoparks Network (since 2000) the Asian-Psific Geoparks Network (since 2007) and the Latin American and Caribbean Geoparks Network (since 2017) and is working for the establishment of similar networks in other regions.

The GGN taking into account the need of coordination of Geopark activities at the national level and the increasing number of UNESCO Global Geoparks, encourages the operation of a GGN national body including all the members of the GGN in each country.

Working Groups have been authorised by the Executive Board to implement programmes and activitys, and to serve as a channel of communication between members of the GGN with

similar scientific and professional interests. Currently there are the following GGN Working Groups: on Geo-Hazards, on Geoaprks in Volcanic Areas, on Geological heritage assessment, on Tourism, on Education, on Sustainable Development Goals, on Island Geoparks.

The GGN is collaborating with specialists and investing towards a global marketing and communication strategy on UNESCO Global Geoparks.

The GGN established a partnership with World Tourism Organization on the International Year of sustainable tourism. The GGN coordinates the Geopark participation and promotion in International Tourism Fairs such as (ITB Berlin, FITUR Madrd, ITB-Hong Kong, etc to promote Geoparks as sustainable tourism destinations and build new bonds with teh international tourism market.

The GGN is operating a variety of communication tools to disseminate information among its members and to promote the Geopark concept and activities to the broad public.

The GGN organizes campaigns for the celebration of international days such as Earth's day, Mountains day, Natural Disaster reduction day, Museum's day, World Environmental day etc.

The GGN organizes capacity building activities to disseminate knowledge on Geoparks building and management focusing on geographical areas with less representation in the Network. Capacity building activities are implemented in collaboration with UNESCO, national authorities and universities as well as regional and national Geopark networks.

GGN celebrates in 2019 15 years of successful operation and development and faces new challenges for the years to come. These include the development of Geoparks in all continents, strengthening of Geoparks visibility through marketing and communication, the implementation of best practices in geodiversity management, geo-conservation, geo-tourism, geo-education and sustainable local development as well as the high quality activities and services for visitors in the UNESCO Global Geoparks.

IMPLEMENTATION OF THE AGENDA 2030: UNESCO GLOBAL GEOPARKS AS REGIONAL MODERATORS

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Keywords: SDGs, model region, conflicting interests, trade-offs, moderation

We need sustainable lifestyles and economies – because of the planetary boundaries and because of the large number of people who continue to live in unworthy conditions. To achieve this goal, the international community has agreed on a binding global vision, laid out in the Agenda 2030. With its 17 universal Sustainable Development Goals (SDGs), the Agenda 2030 pursues a holistic approach. Their implementation requires strong institutions, participatory decisions, transformative knowledge, new economic forms, as well as the balancing of interactions and conflicts of interest.

UNESCO Global Geoparks (UGGps) combine geological history with sustainable regional development, education and sustainable tourism in a holistic approach. They deal not only with regional issues, but also with global social challenges, such as the finiteness of natural resources and climate change. This makes them ideal candidates to become model regions for sustainable development, creating real added value for the respective region and the population. Embedded in networks from the local to the international level, UGGps form an important interface and enable a comprehensive examination of questions concerning a sustainable future for all. In this context, Geoparks can also take on the role as regional moderators: They generally have good connections to key players in their regions, such as representatives from the local communities, from nature protection, agriculture, forestry and the local industry, as well as to educational and scientific facilities. These extensive partner networks enable Geoparks to mediate between different interest groups, inform the wider public and involve local decision-makers.

The UGGps key role within their specific regions carries very high potential for acting as regional moderators to help tackle complex challenges in the face of global change and play a leading role in the implementation of the Agenda 2030. This moderating role is important as possible solutions are rarely straightforward but involve conflicts of interest and trade-offs. The transition to a low carbon and environmentally friendly energy supply provides a good example for this: While, for instance, wind energy plants contribute to SDG 7 (affordable and clean energy) and SDG 13 (measures for climate protection), they also give rise to dissent, e.g. from a nature protection perspective (SDG 15). Having very good ties with a multitude of regional stakeholders - within the scope of their possibilities - UGGps can contribute to discussions, for instance, about renewable energies (wind power, solar energy, etc), in exploring potential synergies between climate change mitigation and nature conservation, finding local solutions for handling common goods like soil, groundwater or being involved in transformation processes of abandoned mining areas.

UGGps can also play a central role regarding SDG 4, which deals with Education for Sustainable Development (ESD). The holistic education approach of UGGps make them ideal moderators for institutions as well as stakeholders in building regional ESD platforms.
Overall UGGps find themselves in a position to assume a leading role in moving towards sustainability, not only in each UGGp's respective region but also beyond. The regional and global networks of the UGGps provide the perfect platforms for exchanging ideas, strategies and concepts, as well as implementation experiences and examples of good practice.

INAUGURAL CONFERENCE

GEOPARKS: EARTH'S MEMORY, PEOPLE'S FUTURE

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We live in a strange world. "The times they are a-changin'", sang Dylan. Time flies by and our reality is in constant flux. When a new generation comes of age, the previous generation witnesses how their way of seeing the world is lost forever. It is part of a natural evolution and it has always been so.

Nonetheless, things are changing faster than ever and we are losing things along the way. Almost no one can escape globalisation. Hotels, birthday parties or shopping centres all look and feel the same — be it in London, Casablanca or Beijing. We live connected but information flows at a speed that overwhelms us. We all want to visit the same places and take the same pictures. More than half of the global population lives in large cities, buys the same clothing and listens to the same music. Everything moves at a lightning speed and we have become starlets of it all. We live in an age of selfies and photobombing. We lose our identity, our initiative and our focus.

There are so many quickly-happening changes that some say we are living a new geological age: the Anthropocene. Be it true or not, what is undeniable is how human activity has significantly altered the Earth's natural systems: the climate is getting warmer, levels of biodiversity are diminishing and soil is becoming less and less fertile. The most vulnerable layer of the Earth where life flourishes is under threat. This is not an interpretation. These are hard facts that demand a staunch response.

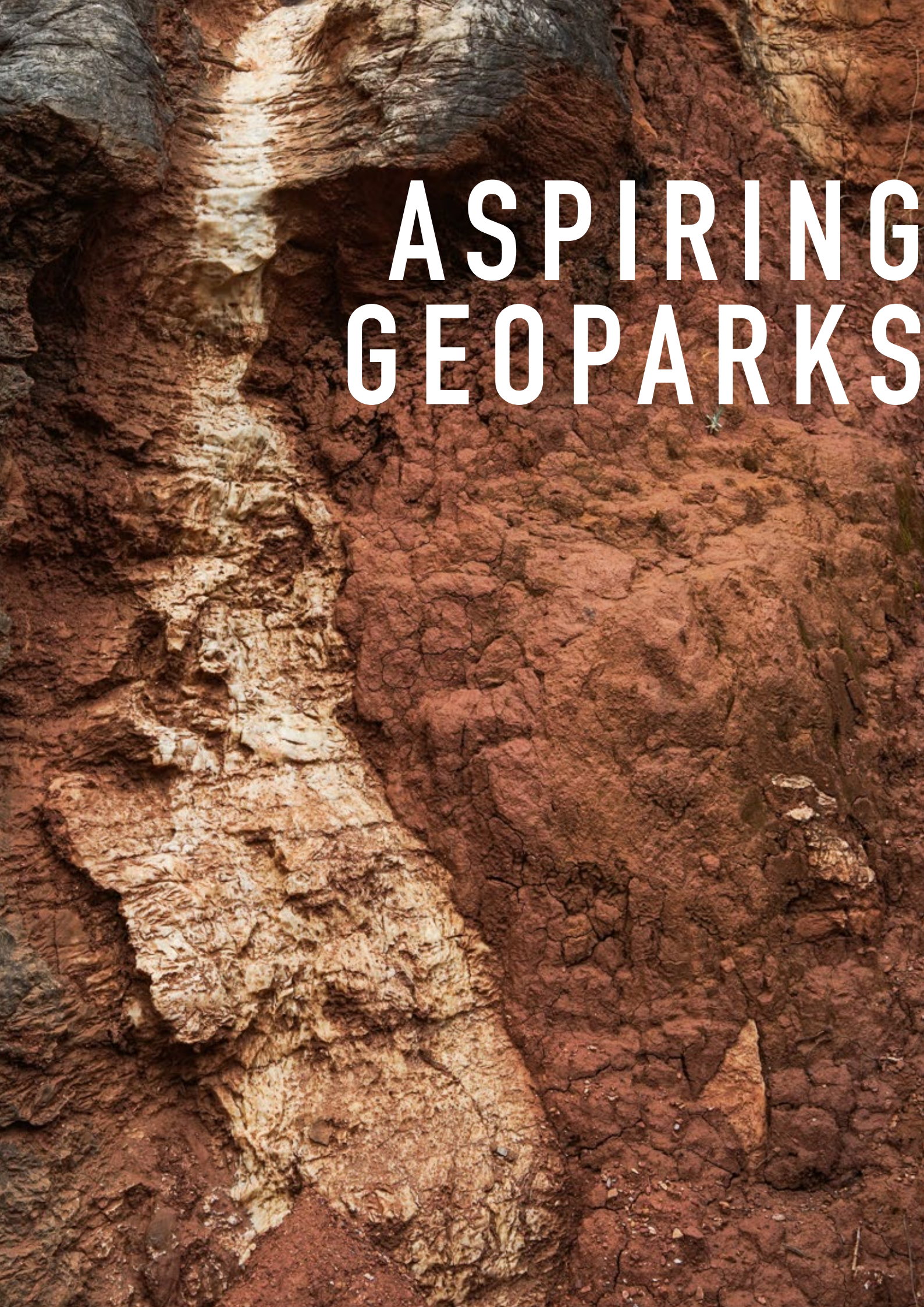
We need to recover the essentials—connect with Pachamama, with Mother Earth, her landscape, her people, her colours and flavours. We cannot undo global economic and environmental policies, but we can act locally and build a network of small beacons for a better world. The UNESCO Global Geoparks are an extraordinary tool to do so.

The Earth uses its unique language to communicate through the Geoparks. Our rocks are pieces of a giant puzzle that allow us to rebuild Earth's history - 4.6 billion years filled with fascinating history. If we can understand that the landscape surrounding us is just the frame of an unstoppable process where geography is constantly changing, we would experience a truly enriching intellectual experiencethat forcesus to question our very own existence. Understanding where we belong in the world is the key. It is the greatest lesson of humility one can ever experience.

We can take on current and future environmental challenges,if we can understand the past. History repeats itself. Geology provides a historical context that allows us to quantify and compare the magnitude of the changes the Earth is undergoing. We must demonstrate that climate change is disproportionate. But, disproportionate in what regards? We need to understand how systems work before we can identify high risk levels. Geoparks provide hundreds of examples to guide us in our comprehension of how climate change in the past and what the true consequences of global warming are.

Geoparks don’t just contain rocks. These areas offer a multi-colour, cultural mosaic of the traditions of its inhabitants that have managed to stave off globalisation. Regional history, language, identify and flavours vary just as much as its landscape, rocks and forests. This is where the wealth lies. It is all interconnected. Geoparks invite individuals to connect to the essence, pause and look around slowly.

Come and listen to the voice of the past. The Earth communicates with us. Let’s keep looking forward. Let’s allow time to pass by slowly.



ASPIRING GEOPARKS

THE DEVELOPMENT OF A MUD VOLCANIC BADLAND GEOPARK – A SUSTAIABLE CASE IN SOUTH-WESTERN TAIWAN

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Keywords: Badland, Environmental Conservation, Geo-tourism, and Sustainable Development.

As a small island state, Taiwan has to promote Geoparks for environmental conservation purpose. With the support of national policy and active local stakeholders, Geoparks could be a policy tool for Taiwan's sustainable development. This paper first analyzes Taiwan's geological setting to depict why the mud volcanic badland area can be a good candidate for Geopark. Then, based on the in-depth understanding of the area, we show how the social and cultural characteristics of the area makes it an excellent place for promoting a Geopark.

The value of this paper lies in how the local stakeholders and societal forces (such as NGOs and NPOs) use the national policy framework, and how the national initiative for Geoparks makes use of its strong civic power to form an alliance for sustainability. As many great work concentrate on the value of education for Geoparks, how conservation education is intertwined with societal processes and local socio-cultural milieu are worthy of investigation. Of significance is the local perception of their own environment's pros and cons. In this case study, the locals make decision for Geopark promotion based on the understanding of their "infertile" land and "marginal" cultures. There are many work on how geoparks could be tools in alleviating poverty. However, in this mud volcanic badland area, people are not poor. They are anxious to conserve their fragile land for traditional wisdoms and techniques under the muddy badland environments. They also want to pass their values and traditions to the future generations to maintain the good earth and the land that their ancestors thrived with hard work and wisdom.

The methods of this paper include participant observation and qualitative interviews. With long term participant observation in the mud volcanic badland villages, we are able to obtain insights about the motivation of the people for promoting the Geopark. Qualitative interviews allow us to look into the stake holders' various values and thoughts. This paper adopts a view of political ecology to illustrate how the local environment has nurtured the local lives and cultures, and helped to maintain the environmental wisdoms that could be local prides.

INTERPRETATION OF GEOLOGY AND THE SAIMAA SEAL FOR GEOTOURISTIC PURPOSES

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Keywords: Aspiring Saimaa Geopark, interpretation, geotourism.

Aspiring Saimaa Geopark has many geological values, including rapakivi granites, massive ice-marginal formations known as the Salpausselkäs, the different drumlin variations in the Pieksämäki drumlin field, and the development of Lake Saimaa after the last ice age affected by southeastern tilting of the ground due to uneven uplift. This development and the story of Saimaa can be seen in the natural environment as ancient shorelines at various heights, rock paintings, Stone Age settlements and endemic species from which the Saimaa ringed seal is the most famous.

One of the main goals in the aspiring Saimaa Geopark is to make geological, natural and cultural features and their link visible for the people in the proposed Geopark area and also for the students and visitors. Geotourism has raised its popularity in Finland and worldwide. Keeping that in mind, the visibility is very important for the Geoparks. During the last three years aspiring Saimaa Geopark has interpreted geological, natural and cultural features and raised its visibility in a very classical way – through information panels.

The Saimaa information signs project started in 2017 and ends this year. The project is funded by the Southeast Finland and South Savo Centres for Economic Development, Transport and the Environment and the European Agricultural Fund for Rural Development (EAFRD). The project produces information signs around proposed Geopark area. Aspiring Saimaa Geopark has 65 geosites and 53 natural and cultural sites. During this project almost every site is going to be guided by at least one sign. The geological information in the signs is designed by Geopark's geologist Kaisa-Maria Remes and natural and cultural information is compiled in cooperation with other experts and Geopark's municipalities. One excellent example of this cooperation is the Saimaa Seal trail in the municipality of Puumala. In summer 2019 the Saimaa Seal trail will have several signs along the path. The signs tell about the esker terrain on which the trail is built and about the Saimaa ringed seal and its biology. The municipality builds an accessible resting place including lean-to shelter along the path, on the shore of Lake Saimaa. The wear of the path will be monitored and measured regularly. That way aspiring Saimaa Geopark and the municipality have information about the environmental influence of the visitors and can prepare for it.

THE UNESCO GLOBAL GEOPARK CANDIDACY OF LA HAGUE IN THE NORTHWEST PART OF COTENTIN (NORMANDIE, FRANCE)

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Keywords: Aspiring Geopark, Cotentin La Hague, Geotourism, Education.

Last year, at the 8th International Conference on UNESCO Global Geoparks, Jacques Avoine and Laura Baillet from the geological heritage association of Normandy presented a Cotentin Geopark project. One year later, and in agreement with the Cotentin agglomeration community, the new town of La Hague (amalgamation of 19 municipalities) intends to apply the UNESCO Global Geopark label within two years.

Member of the Cotentin agglomeration community, La Hague has been thinking for some years about the opportunities to value its exceptional natural, cultural and geological heritage. The national geoheritage inventory has highlighted 15 remarkable geosites on our area. This heritage reveals especially the continuous two billions years Earth's story. This geological heritage illustrates climate change through in particular the Quaternary sections and the last glaciation Würm. La Hague reveals moreover a remarkable diversity of landscape (steep cliffs, dunes, hedgerows, beaches, etc.) recognized by a national protection. This landscape diversity is especially a first key to understand geology. Over 150 square kilometers, the 15 sites are almost all connected by the GR223. This area (smaller than other Geoparks) is suitable for trekking or biking, which responds to the principle of sustainable or slow geotourism. Moreover, La Hague can rely on structuring equipments: a planetarium observatory, a natural and cultural heritage Center. In addition, the territory is able to count on tourism offices, Cotentin Agglomeration Community, department, or public and private partnerships. This Geopark project gives sense to many actions, which already promote natural and cultural heritage. Most actions that gradually emerge could be put into this global project. For a year, we have established a scientific committee and restructured a research program on the archeologic, history, and anthropology of La Hague, which has started for the next 15 years. We have implemented a working group with teachers from kindergarten to high school to jointly develop an educational program for the Geopark. The ambition of the territory is to develop a responsible geotourism and actions concerning education. We hope that all these actions are going to contribute to the economic development of the territory and of the Cotentin Peninsula. The first step will be to create a La Hague Geopark ; then, secondly a Cotentin Geopark. But it will be a second step and another application. We have to be realistic and pragmatic.

GAMIFICATION AS GEOEDUCATION TOOL IN LAUHANVUORI-HÄMEENKANGAS ASPIRING GEOPARK

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Keywords: Education, Gamification, Augmented Reality, Aspiring Geoparks.

Gamification denotes a game-like approach to non-game situations. A gamified approach has been utilized as a tool for geoeducation in Lauhanvuori-Hämeenkangas Aspiring Geopark in Finland. In addition to teachers, persons with no formal education in pedagogy can achieve positive learning results using this approach.

Geology is not part of school curriculum in Finland. The subject is touched upon in geography, which in Finland appears in curriculum at the age of 13. Prior to this age, geographical subjects are part of environmental learning classes. The perspective to geology is introductory and at national level.

To facilitate the teaching of geology to pupils with very little prior knowledge of the subject, a gamified approach has been used. This incorporates activating children's interest by introducing a game element to the teaching situation. Examples of gamified elements include animations and game graphics in visual materials, utilizing augmented reality technology and introducing quests in field learning.

Animations are a good tool for visualizing geological processes. Adding imaginary characters to the animations captivates the viewer and engages pupils that may not necessarily be interested in the subject matter. A series of seven geology animations has been produced to facilitate learning about the geological development of the area and is freely provided for use in schools by the Aspiring Geopark.

Augmented reality has been utilized in learning of geography in the form of an augmented reality sandbox. This open source project was built in 2017 and is available for school classes and camps in the Jämi nature center. The sandbox includes real-time geographical content that can be manipulated by shaping the sand by hand. Introduction and guidance to the use of the sandbox is provided freely by the Aspiring Geopark.

Quests in the field classes incorporate taking pupils to real locations, introducing tasks that require observation of nature, geography and geology, and introducing an element of contest. Teaching about landforms in a game-like setting motivates children and fosters their natural curiousness. The Aspiring Geopark personnel supports field learning by providing guidance and quests to school classes free of charge.

A gamified approach to learning about abstract processes increases the motivation to learn and eases the workload of teaching personnel. Gamification can be applied on all technological levels, from pen and paper to computer environments.

THE ODDESUND TOWER – AN INFORMATION LIGHTHOUSE

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Keywords: Communication, Geotourism, Interpretation centre.

In December 2018 the Oddesund Tower was inaugurated as a new attraction in the centre of the aspiring Global Geopark Vestjylland in the western part of Denmark. The Tower presents information on geology, cultural history and nature. There are four floors in the tower shaped as a lighthouse that serves as one of the entrances to the geopark. Information is presented using touch screens, panels, sound, displays and art. With its very special design the tower also serves as a landmark to attract more visitors. The tower is located in geosite no. 39, Oddesund which at the same time is also a non-geological site. It is a very special coastal landscape dominated by two spits extending towards each other from north and south with a narrow sound between them. Together with the hinterland and the coastal cliffs on either side the area offers an excellent impression of how coastal erosion and deposition have formed the dynamic landscape. The site has served as one of very few connections between North and South Jutland, the main peninsula of Denmark and has thus been very important in connection with military considerations and infrastructure development. There are German bunkers from World War II used for cultural events, remnants of the old ferry harbours used by the old rowing boat ferries and the later steam engine ferry until a bridge for both cars and trains was built. Large parts of the surrounding area with tidal meadows, marine foreland and small stretches of heathland are protected nature and have been designated as a Natura 2000 site. The tower also tells many other stories such as the story of "The Closet Man" – a man who came to Oddesund in 1917 and lived in a closet until he died in 1956. There is information on storm floods, how fishing has developed and been influenced by big changes in the landscape. A touch panel informs the audience about other sites and possibilities in the geopark. The tower has been built by Struer Municipality – one of three municipalities in the geopark – in close cooperation with the geopark and local volunteers with a huge knowledge of the site and its history. In connection with the tower a local trail takes visitors around the area where information panels have been erected at key points. Access for visitors with mobility impairments to the tower is also possible by elevator that can take them to all floors.

THE ASPIRING NORMANDY-MAINE GEOPARK A REGION OF NATURAL, CULTURAL AND MYTHOLOGICAL HERITAGES BORN OUT OF ITS GEOLOGICAL UNIQUENESS

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Keywords: Aspiring Geopark, Geoheritage, Sustainable development, Education, Geotourism.

Located in the west of France, straddling Normandy and the Pays de la Loire, the Aspiring Normandy-Maine Geopark covers 2,572 km and includes 139 municipalities.

The Geopark bears witness to a geological history whose earliest traces date back to the Brioverian period, nearly 600 million years ago. During its geological history, four major elements have left their mark on the region (1) Cambrian Volcanism: traces of which are still visible in several parts of the region today. (2) The Hercynian Orogenic belt: after a long process of erosion this mountain range formed a crest line that today gives structure to the region from east to west and is home to the highest peak in western France (416m). (3) The Paris Basin, which in the Mesozoic era covered the foothills of the Armorican Massif. The Basin creates a different agrarian landscape in this part of the region. Finally, (4) the lowland screes emanating from the cold ages of the Quaternary are an exceptional element of the geological heritage of this candidate region.

In ancient times, the region was covered with a vast arc of forest effectively establishing a border which influenced the settlement of Man. From the first prehistoric camps, to the Gallo-Roman occupations, up to the current administrative boundaries, the traces left by Man reveal a long history of overlapping authorities. The territory was therefore strongly built in a cross-border approach. The name of the Geopark originates from two duchies that left their impression during the Middle Ages: Normandy and Maine. Many strongholds testify to this medieval epic and are for some, regional geosites.

The Geopark is supported by the Normandie-Maine Regional Natural Park. Its governance is ensured by the elected representatives of the Park and implemented by the team in a transversal and multidisciplinary way. Many partners come together in this project. The Park's commitment to its geological heritage began in 2007 with its contribution to the geological heritage inventory. It enabled us to retain 75 sites.

The dynamic commitment to the Geopark is already generating a major added-value for the region through actions already implemented and those in progress (education, geotourism, development project, ...). Achieving the Unesco Global Geopark status would provide valuable international recognition, thereby helping to strengthen the residential and tourist appeal of the region, a lever for local economic development that will protect these assets.

THE EFFECTS OF GEOSITES ON HEALTH AND WELL-BEING - FROM ANCIENT BELIEFS TO THE MODERN TECHNOLOGY

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Keywords: cultural heritage, well-being, nature, geosites, aspiring geoparks.

The effects of nature on health and well-being of humans have been understood in the Lauhanvuori−Hämeenkangas aspiring Geopark area throughout the times - only the methods how the effects are achieved have changed from the ancient times.

The Lauhanvuori−Hämeenkangas aspiring Geopark has a few geosites that have believed to have effects on health of people. One of them is Spitaalijärvi (‘Leprosy lake’) in Lauhanvuori National Park. Its water has low pH, about 4.7, and it has believed to cure especially skin diseases. That famous “cure water” was transported to the aristocracy of Russia, also.

Another geosite with believed health impacts is Uhrilähde spring (‘Sacred well’) in Hämeenkangas. People used to come to the spring to find healing for eye ailments, among other things. They threw an offering into the spring, and that is how the spring got its name. Local people still baptize their children with the water of Uhrilähde.

Well-being trails are far more recent innovation in the area. The world’s first well-being trail with psychological exercises was established in 2010 in the city of Ikaalinen, which is located next to the Lauhanvuori−Hämeenkangas aspiring Geopark border. Soon after that was created Rantareitti well-being trail ashore on Kaidatvedet lake, one of the geosites. The exercises along the trail resemble mindfulness that helps visitors to settle their minds and to feel better both psychologically and physiologically. The well-being trails were developed by the Natural Resources Institute of Finland together with their international partners. In addition to the public trails, there have been opened private well-being trails by the tourism enterprises in the aspiring Geopark area.

“Well-being from nature” is part of the Lauhanvuori−Hämeenkangas aspiring Geopark brand. Side of the ancient cultural stories there has come new technology to verify and to give measurable proof of the effects of nature on health and well-being. One of our member entrepreneurs have packaged the ”Empowering Nature Weekend” which includes information about stress management and Firstbeat Lifestyle assessment with technological analysis of physical and mental loads and recovery performed during the weekend. A medical doctor and a physiotherapist are guiding the visitors during the weekend at the scenery of Alkkianvuori geosite. Guests are taken to pick blueberries along the slopes of Alkkianvuori hill, also.

We have been used to experience the effects of nature on the well-being and health as part of normal life before. Nowadays it cannot be considered self-evident at all. It is our task to give the people the tools and to teach them to utilize our nature and sites to feel better. Places where we can stop and sense the nature’s effects are everywhere. With guided exercises we can teach people to recognize them in their own environment, as well.

"JURASSIC LAND": TOWARDS AN INTEGRATIVE APPROACH FOR AN ASPIRING GEOPARK IN WEST-CENTRAL PORTUGAL

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Keywords: Aspiring Geopark; Dinosaur; Resources; Landscape; Adaptation.

The coastal area of Central Portugal is internationally well known for its relevant paleontological content, namely its abundant and important Late Jurassic dinosaur remains, including unique species and some well-preserved egg nests, with over two hundred sites delivering materials presented in dozens of academic thesis and relevant journals. The region is also known for the presence of an international GSSP for the Toarcian age (ratified by the ICS in 2014) and for world-class cliff exposures of Late Jurassic fluvio-deltaic units (Lourinhã Formation). All this justifies the chosen designation of "Jurassic Land". However, a Geopark isn't meant to be just a great "open-air museum" for scientists or educated citizens - it must be a dynamic place, where all the geologic and other naturalistic aspects are approached and used to strengthen the public awareness of the region's potential, to attract local and external people to visit and explore it. Therefore, an obvious question arises - what should be the scope of this specific Aspiring Geopark? The proposal is to use the territory and the landscape as a natural guideline to address different paleontological and geological aspects, but also some important societal implications, within the broad spectrum of "landscape, natural resources, risks, changes and adaptations". Some examples of geological aspects used to approach these themes, are listed below: i) Late Jurassic fossils, mainly dinosaur bones and eggs *vs*. evolution and adaptation; ii) Late Jurassic fluvio-deltaic formations *vs*. Jurassic landscapes and paleoclimates; iii) Early Jurassic stratigraphic sequence and Toarcian GSSP *vs.* climate changes and Oceanic Anoxic Events; iv) Fluvial valleys *vs.* climate changes, glacial incision and post-glacial infill; v) Coastal cliffs, lagoons and estuaries *vs.* historical and geological evidences of sea-level changes, erosion and "tsunamis"; vi) Piercing salt diapirs *vs.* geological resources, including thermal waters and gypsum; vii) Geomorphology *vs.* urban or agricultural adaptations; viii) Iconic cliffs, hilltops or rocks *vs.* local cultural, aesthetic and spiritual values. This "broad-band" approach will be developed under the "*Top 10 Focus Areas of UNESCO Global Geoparks*", which include themes such as "Natural Resources", "Natural Hazards" and "Climatic Changes". A prime role and importance will be given to the other "Top 10" focused themes: "Science", "Geoconservation", "Education", "Culture", "Local Knowledge" and "Sustainable Development" (mainly ODS4, ODS8, ODS11 and ODS15). The future activities of the Geopark are also intended to contribute to the "*National Environmental Education Strategy"* (ENEA), namely on "Axis 3 – Valuating the Territory", sub-themes "Natural Values" and "Landscape". A preliminary list of over 40 Geosites covering these different issues has already been established and will be further developed, with the help of the academic community and mainly in close dialogue with local stakeholders, including basic and secondary schools, tourism-related entities, environmental and cultural associations, etc.

SALPAUSSELKÄ ASPIRING GEOPARK: WORLD-CLASS EXAMPLE OF ICE-CONTACT DELTAS

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Keywords: ice-marginal formations, deltas, Salpausselkä, aspiring geopark.

The aspiring Salpausselkä Geopark is situated in Lahti region, in the Southern Finland. The area covers some 4 500 km^2. The most significant features in the geopark are Salpausselkä ice-marginal formations, the best-known geological entity in Finland, which are at their most representative in the Lahti region. In addition to the Salpausselkä formations, their feeding eskers are central features in the geopark area as well.

The Salpausselkä formations are related to the cool climate period known as the Younger Dryas 12 800-11 600 years ago. During this period lot of gravel and sand deposited at the margin of the Fennoscandian ice sheet. Most of the sediments were delivered to the ice margin by melt water and deposited in the form of ice-contact deltas, over a very short period. Rapid sedimentation from high-magnitude melt water discharge happened mainly through subglacial channels. In the Lahti region two ice lobes of the ice sheet were confluent and the largest deltaic complex developed there. The largest deltas are formed by amalgamation of several smaller ones. Distributary channels network is still visible in many places on the flat delta top. There is also evidence of ice margin oscillations and partial overriding of deltas.

Salpausselkä formations are a world class example of a sedimentary environment which records the processes of the formation of ice-contact deltas. There are many features with international geological value in the area. These formations are also of great importance to geological research. They represent a strong evidence of the prehistoric climate change at the end of the last Ice Age. Numerous deltas show clearly the changes of the water level in the Baltic Sea during the deglaciation stage.

Thanks to Salpausselkä formations Lahti area is one of the most popular targets for geological excursions in Finland. Already in 1897 participants from the 7th International Geological Conference in St. Petersburg had an excursion to study Salpausselkä in Lahti. Although in Scandinavia, Russia and North America there are many formations dating back to the same period as Salpausselkä, the classical formations of Salpausselkä are still studied and widely referred to in geological research all over the world.

Salpausselkä formations with thick sand and gravel layers are very important groundwater recharge areas. Groundwater bodies under Salpausselkä formations are large and the quality of the water is among the best in the world. Groundwater is an important natural resource in the Lahti region for the region's strong brewery and food industry. The surface waters of the region are of great importance as well; more than one million people in the capital area of Finland get their drinking water from southern Lake Päijänne.

The aspiring Salpausselkä Geopark highlights the Salpausselkä end moraines with world class ice-contact deltas and hydrogeological processes in the formations providing us with clean fresh water.

STORYTELLING IN ASPIRING PLATÅBERGENS GEOPARK, WEST SWEDEN

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Keywords: Aspiring geopark, Interpretation, Storytelling, Geotourism.

Aspiring Platåbergens Geopark is situated in west Sweden, in the region of Västergötland. Covering nine municipalities and approximately 3600 km^2, the main attractions are the 15 classic table mountains, which has been an important area for geological research since 18th century. The table mountains themselves are relicts of Palaeozoic cover of sedimentary bedrocks and stands out as prominent features in the landscape. The cultural landscape surrounding the mountains is one of the most prominent in Sweden, with a history going back to the Megalith culture 5000 B.P. Underlying the table mountains is the sub-Cambrian peneplain, which is well preserved and well visible in the aspiring geopark area. The region also contains landforms created during two of the most important events during the late Quaternary of Sweden; the Younger Dryas cold interval and the drainage of the Baltic Ice Lake.

In this presentation, we aim to tell about how we use storytelling as a method to engage a wider audience in our geological heritage. This is a central part of our interpretation work, and is used on our website, in our app, in brochures and on YouTube. We use four storytelling themes, covering geology, cultural history and outdoor life: 1) "A piece of Earth's history – a journey in time through 1700 million years", 2) "Earth brings life – the first communities", 3) "Rocks for living – the humans and the mountains as resources", 4) "The mountains are alive – nature and the outdoors today".

By using storytelling as a tool, we strengthen geotourism and the brand "Platåbergens Geopark" by using the unique identity of the area: the natural and cultural heritage. Storytelling is an efficient tool to demonstrate the values we find in the landscape. By telling stories, we use pictures, symbols and emotions to build a trademark: we create emotional experiences that last! For visitors and inhabitants in our area, it will be easier to understand our geological heritage, and directly engage in the geopark's development, for example through social media.

ASSESSMENT OF THE GEODIVERSITY OF ARAS ASPIRING GEOPARK, IRAN

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Keywords: Aras, Geodiversity, Geopark, geosite, Iran.

The area of study is within the boundary of Aras Aspiring Geopark, located in the northwest of Iran with an area around 1670 km^2.

The geodiversity of this area is very high, there are various types of sedimentary and igneous rocks and a diversity of geological structures.

The most important geological features of this region include the Paleozoic-Mesozoic sedimentary sequence, especially the Permian-Triassic boundary deposits that has a high scientific value. There is also a wide range of igneous rocks, the occurrence of various types of tectonic features (faults, and folds). Erosional features include an unconformity and a landslide. The area is also characterized by fossil sites, travertine springs, ripple marked surfaces and erosion phenomena such as hoodoo, tafoni and flatiron geology.

This presentation will assess the geodiversity of the area using the method of the inventory and assessment of geosites and geodiversity proposed by Brilha 2015. This method involves, firstly describing the elements of geodiversity and then producing a description of geological sites in two categories, a “geosite” and a “geodiversity site”. Next, assess each site for its scientific value, potential for educational use, potential for tourism and degradation risk. Finally the results show which sites have the highest value and highest risk for degradation.

Carrying out these assessments is important for managerial purposes, as managers will then be able to plan an appropriate and comprehensive program to conserve the high priority sites.

ESTRELA ASPIRING GEOPARK: HERITAGE AND TERRITORY IN THE CONSTRUCTION OF A NEW DEVELOPMENT PARADIGM FOR COMMUNITIES

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Keywords: Aspiring Geopark, Heritage, Sustainable development, Territory-

With a unique Geological Heritage, Estrela constitutes the most important Mountain in continental Portugal, not only from the geological or geographic point of view, but also by an identity strongly marked by a history of adaptation to the territory. Since 1881, the year in which the great scientific expedition to serra da Estrela, organized by the Lisbon Geographical Society, occurred, studies that reveal the pivotal role of this territory and the relevance of its heritage have continued, with examples such as Hermann Lautensach, Suzanne Daveau, Orlando Ribeiro, Brum Ferreira or, more recently, Gonçalo Vieira.

In recognizing the scientific, educational and cultural value of this territory, the development of the application of Estrela for membership of the UNESCO Global Geoparks Network started in 2014, with the aim of submitting the application in 2017. The decision for this application is based on four main ideas: the valorisation and conservation of its 124 sites of geological interest, the development of a scientific and educational strategy that promotes knowledge and dissemination of the resources of this Aspiring Geopark, the construction of new tourism approaches based on new products, more sustainable and in line with its indigenous potential, and finally, in the promotion of a new way of communicating the territory, based on the UNESCO Global Geoparks Network brand, which could translate in to a new approach for this territory. A UNESCO Global Geopark only makes sense if it, in fact, involves a holistic strategy for territorial development, bringing together different resources, identity, history and communities, the last being a condition for the existence of this classification. Thus, the main goal of the classification of the Estrela as a UNESCO Global Geopark is that this recognition constitutes a new paradigm for sustainable development.

As such, over the past five years, the Estrela Aspiring Geopark has sought, through partners, the strong involvement of the 9 municipalities that comprise this application and the educational institutions and communities, to build a new development paradigm, in which rocks, geology and its heritage are the starting point for this enormous challenge. Through the sustainable vision of its resources, this Aspiring Geopark has involved different development vectors, such as geoconservation, education, science, tourism, the circular economy and sustainability. All of these vectors are structured in a holistic way, contributing to the sustainable development of this territory that seeks within the concept UNESCO Global Geoparks, an effective opportunity to define new development directions, changing the current paradigm and reinforcing the creation of wealth and added value for its communities and reversing the process of depopulation that Estrela has experienced since the beginning of the second half of the 20th century, in the belief that this will be the major development strategy for this Century.

THE SOUTH FYN ARCHIPELAGO ASPIRING GEOPARK – LONG TERM RELATIVE SEA-LEVEL CHANGES IMPACTS ON NATURE AND CULTURE IN SHALLOW MARINE SETTING

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Keywords: aspiring geopark, Danian-Selandian boundary, Eemian-Weichselian Baltic reference section, Holocene transgression, submarine Stone-age settlements.

The aspiring South Fyn Archipelago Geopark, covers an total area of 2.730 km^2 and it is placed in the central part of Denmark, Fyn. In 2014 Denmark got its first and only Geopark- Odsherred Geopark - in eastern Denmark, Zealand.

The aspiring South Fyn Archipelago Geopark includes approximately 1.300 km^2 of shallow marine sea, where a unique natural and cultural maritime heritage have developed the last 12.000 years. Today, one can observe the on-going geomorphological processes within this shallow marine area such as tombolos, cuspate forelands, pointed and curved spits, reefs, coves, littoral and beach meadows. These coastal landscapes form the basis for a diverse and protected birdlife within the aspiring Geopark. Furthermore, more than 25 islands are located within this shallow marine representing a former landscape which drowned during the Holocene transgression approx. 9.000 BP ago. Thus, already during the Danian-Selandian transition, 63 million year ago, the South Fyn Archipelago aspiring Geopark area experienced pronounced sea-level changes. These can be studied in high-resolution at the international geological site named Klintholm Limestone Pits where the Danian-Selandian transition is marked by a shift from fossil rich bryozoan limestone to deposition of marls.

At the coastal cliff, Ristinge Klint, Langeland, sedimentary deposits spanning from the last interstadial, Eemian, to the end of the last ice-age, Weichselian, are beautifully exposed as glacial folded layers. Ristinge Klint is a reference section for the Baltic area and throughout the Geopark Eemian brackish to marine clayey deposits named the Cyprina Clay, have influenced the nature and culture in the Geopark. At Ærø eight brickworks exploited this clay-resource during a nearly 60-year long period. Furthermore, the Cyprina Clay and other younger strata have been influenced by intensive Weichselian glacial tectonism resulting in large rotational landslides at Voderup Klint, northwest coast of Ærø. The Voderup Klint area have the last hundreds of years formed the basis for a unique and very diverse habitat for plants and animals.

The joint-municipal organization behind the aspiring Geopark, the former Naturturisme, infrastructure comprising of a 220 km long hiking trail, bicycle and mountain bike trails of international standard, horse riding trails, shelter and kayak facilities, scuba diving trails and excellent harbor facilities for sailboats. The infrastructure provides both inhabitants and visitors with a unique possibility of access to both the Geological, Natural and Cultural Heritage of the South Fyn Archipelago aspiring Geopark.

RUSSIAN REGIONAL GEOPARKS NETWORK: PROSPECTS AND CHALLENGES

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Keywords: Aspiring Geoparks, Russia National Geoparks Network, Geosites.

Over a few past years, geoparks have been actively established in Russia, which reflects the State's policy on boosting local incoming tourism as well as expanding the protected areas of Russia. Like all over the world, natural heritage sites provide a base for establishing geoparks in Russia, and there are about 3,000 of them in the country.

At present, there are four regional geoparks in the Russian National Geoparks Network:

The Altai Geopark – in the Altai Republic with the unique Giant Ripples geomorphological object; The Undoria Geopark – in the Ulyanovsk Region with Carboniferous sections along the Volga brinks perfectly described in terms of paleontology; The Yangan-Tau Geopark – in the Republic of Bashkortostan with Yangan-Tau (Burning Mountain) and the Mechetlino Section nominated as the gold nail (ground reference mark) of the Bashkirian Stage of the Middle Carboniferous; The Ingermanlandia Geopark (established in 2019) with the Baltic Klint – a geological site of international value.

Many regions in Russia are involved in creating geoparks: Siberia (The Baikal Geopark which includes Olkhon Island), the Urals (The Ural Gemstone Belt Geopark), northern Europe (The Kenozero Geopark), the Caucasus (The Sarykumsky Geopark in Dagestan) and Yakutia (The Lena Pillars Geopark).

The experience of creating geoparks in Russia suggests that the major factors hindering the development of the Russian National Geoparks Network are:

1) Population; regional authorities and most of the geological community are not fully aware of what a geopark is. The majority consider a geopark to be a conservation scheme aimed at the protection of natural areas where economic activity is illegal.

2) Businesspeople from the tourist industry in an aspiring geopark are concerned that its establishment will bring their activities under regulation, eliminate monopolies and decrease their profits.

3) In the Russian federal legislation, there is no legal base for geoparks, no concept of a geopark, however the Law on Protected Nature Areas of Russia allows for the establishment of different conservation schemes. Presence of national and regional heritage sites in an aspiring geopark cause legal problems.

4) Businesspeople are reluctant to invest in projects aimed at creating geoparks. Although, there are many examples of successful development of geo-ecotourism combined with conservation activities in Russia.

The Russian Committee for the UNESCO IGGP actively provides information on creating the Russian National Geoparks Network. With the assistance of the Committee, the Atlas of Unique Geosites in Russia was compiled in VSEGEI (Russia) which provides national and international users with relevant information for their work in science, education, industry and establishment of UNESCO Geoparks. An information retrieval system was created containing systematized data on over 3,000 natural heritage sites in Russia, including established and aspiring geoparks. The website presents the legal documents necessary for the establishment of a UNESCO Geopark and links to the European and Global Geoparks Network sites (http://www.vsegei.ru/ru/info/).

Development of the Russian National Geoparks Network based on natural heritage sites will allow Russia to enter the Global Geoparks Network.

DUTCH GEOPARK FORUM: GUIDING THE GROWTH OF GEOPARKS IN A LOW-LYING COUNTRY

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Keywords: geopark forum, aspiring geoparks, man-influenced landscapes, sea-level rise, watermanagement, guidelines.

The development of geoparks in a small low-lying country with man-influenced landscapes is discussed from the perspective of the Netherlands Forum UNESCO Global Geoparks (NFUGG). Five years of experience and guidance lead to insights in varied approaches of developing geoparks, which can also be useful in other countries and for other geopark fora/committees.

The Netherlands is a small, densely populated country where the landscape is largely influenced and changed by man. The lands have low relief. Many landforms created by rivers and the sea are present but in many areas dissected, altered by man, buried with sediment or encroached by housing and infrastructure. This provides for a huge challenge to form new geoparks.
The Netherlands Forum UNESCO Global Geoparks was formed in 2014 and has aided and critically examined and evaluated several initiatives to form a geopark in different parts of the country.

The Dutch geopark forum, consisting of representatives and specialists in the field of geology, physical geography, historical geography, tourism, cultural heritage and policy, has offered guidelines for aspiring geoparks in The Netherlands. The geopark forum started an analysis of internationally significant characteristics of the Dutch landscape, resulting in a policy document and advice for geopark initiatives. Among other things, a bottom-up approach for developing a geopark has been advised, and a focus on areas, landforms and themes related to the fight against the sea, flooding, sea-level rise and water management.

The geopark forum paid particular attention to give feedback and discuss with initiatives openly the potential of certain areas including technical and organizational issues. A too stringent framework was avoided. In this way, the development of ideas and initiatives for five possible geoparks has been stimulated and guided.

The paper discusses general insights of the factors why some geopark initiatives have been more effective than others. Main obstacles with regard to geopark initiatives so far were: a) not enough priority to identify geoheritage sites of international importance, b) difficulties in establishing a geographically sound/coherent area with natural borders, c) organizational difficulties d) limited scientific/research basis for some areas.

Suggested improvements for specific areas and nation-wide, are: a) better organized or up-to-date inventory of geoheritage sites and their values b) closer attention to whether and how fragmented landscapes can be a part of a geopark and whether geoheritage is sufficiently visible. c) adequate attention to the man-environment relation d) attention for the relation of a potential geopark with existing national parks and nature reserves.

Important and promising themes for geoparks in The Netherlands, untapped potentials and the future role of geopark fora are discussed. The paper proposes a schematic diagram of different approaches/issues for geopark development in man-dominated landscapes compared with more natural landscapes. The evaluation process and other key-activities of a geopark forum is illustrated in a diagram in order to give insight for other geopark fora.

SAWA LAKE OF SOUTHERN IRAQ AND ITS POTENTIAL AS GEOPARK, SCIENTIFIC FACTS WITH HISTORICAL MYTHS

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Keywords: Geopark, Iraq, RAMSAR, Sawa Lake.

Sawa Lake, a RAMSAR site, designated as one of Sahara wetland ecosystem of international importance of the Mesopotamia plain, the land of Sumerians civilizations. It is located 23 km west of Al-Samawah City, with a length of 4.75 km and width of 1.75 km and a barrier of 12.5 km surrounding the lake. In addition to providing a number of provisioning and regulating ecosystem services the lake is of extraordinary geodiversity, biodiversity and historical religion heritage of high importance and values.

Although it is a poorly-known closed water body, it is classified as a unique inland lake because of its permanent water body located in a semiarid region connected to an extraordinary geological phenomenon. There is no exact scientific information about when it was created, but it is definitely related to faulting activities in the area. The lake has no inlet or outlet and is only fed by groundwater which may originates from the Euphrates and Dammam aquifers. Groundwater flows upward through system of joints caused by the main Euphrates fault. Despite the seasonal fluctuation in the water level, the equilibrium state between water feed and evaporation prohibit complete dry up.

Due to its features, Sawa Lake has a significant importance in the Sahara ecosystem as being a crucial area for birds, and its hyper saline water candidate to be a medical resort especially for the treatment of skin diseases. Therefore, it can be classified as a natural resource of a potential for tourism. The place was one of the most important tourist destination sites in southern Iraq since the fourteenth decade of the twentieth century. Unfortunately, now a days, where nothing at all suggests life, but the remains of those destroyed of the tourist resorts.

Sawa Lake has become a legend throughout the ages, known as the “wondrous lake” or the “exotic lake”. Through history, it has been connected to divine miracles unexplained by science. It is said that the lake was flooded at the day of the birth of Prophet Mohammed as one of the divine disabilities. Some also believe that the dryness of this lake, in the future, is one of the signs of the Day of Resurrection.

In order to meet the conditions for and become an aspiring UNESCO Global Geopark Geosites like Salibiat Marsh and the historical Al-Warkaa city have been added to the Sawa Lake geosite. The goal is to increase local people’s awareness about heritage protection.

CREATING A NEW VALUE CHAIN BASED ON CROSS-COUNTRY GEODIVERSITY AND CULTURAL HERITAGE: INSIGHTS FROM THE ITALIAN-SLOVENIAN BORDER

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Keywords: MTDs, tourists and research regional center.

The area located between the Tagliamento river to the west, and the Soča river to the east, across the Italian-Slovenian boarder, is one of the most heterogeneous areas of the northern Mediterranean region, in which development and socio-economical condition can be directly linked to its geodiversity, that is the nature of the intrinsic geological landscape of a given territory. In this specific case, the occurrence of showcase examples of so-called "megabreccia beds" within the sedimentary record that crop out in the local bedrock represents an outstanding characteristic of the region. These Paleocene-Eocene sedimentary deposits, represented by a mixture of different carbonate and siliciclastic lithologies, were generated by submarine landslides, and, due to their prodigious thicknesses and intrinsic characteristics, deeply affect the local to regional (sub)surface geology, with important consequences in terms of geomorphology and geo-resources.

The particular geological history of the formation of such rocks represents an a cross-country opportunity to local communities from both the Italian and Slovenian side. In fact, long-term territorial management based on new knowledge/perception offered by updated scientific research provides a new way of economic carrying out based on unique geological features, such as an 1.) active seismic/structural deformations and geo-engineering features related to non-linear lithological contacts (crawling and related deformations of infrastructures); 2.) different types of karst and its influence of potable water reservoirs and their sensitive ecological status; 3.) hydrogeological (the particular morphology of the riverbed with its sub-basins and associated anti-erosion stream channels management); 4.) pedological (influence on soil fertility for individual horticulture). All these factors, with influence of the 5.) rivers micro-climate, constrained and are still shaping the inhabitants life, typical for this northern Mediterranean regions.

All these circumstances influenced also the mutual socio-economical relationships between Italy and Slovenia, conditioning political and strategic decisions of local and regional administrators deeply influencing the management history of the two nations. Newly acquired knowledge on the formation and evolution of these peculiar rocks (e.g. early diagenesis directly related to climate change), their influence on the shaping of the landscape, and the historical socio-economic potential (e.g. agriculture-particularly the esteemed vineyards, forestry, hydro-energy management, geo-tourism), are herewith proposed as research-educational tools to highlight interactions between human and natural environment.

This self-sustainable state in the region will be achieved through the new perception of the natural environment and valorization of these (geo)sites, through as special tourist offers (e.g. hiking, specific training, extreme sports) and guided learning/research excursions, which will allow to the stakeholders an active interpretation of natural causes who has influences on development of the infrastructure, in the field of provision and management of agricultural and forestry areas, self-handling of mineral resources and materials for construction, efficient energy self-sufficiency with management of torrential rivers…

NETWORKING AND INVOLVING LOCAL COMMUNITIES TO DEVELOP A NEW GEOPARK IN FINLAND

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Keywords: networking, local involvement, aspiring geopark, Salpausselkä, Finland.

The aspiring Salpausselkä Geopark promotes the geological heritage of an area where the massive ice-marginal formations Salpausselkä I and II and their feeder eskers, surrounded by plentiful water bodies, form the backbone of the communities and landscape, which is attractive to local people as well as tourists. These formations are central in the region: villages and towns, roads and streets have been built on them; people go walking, running, skiing, biking, swimming and playing on them - and drink high quality tap water drawn from their renewable groundwater reserves.

Salpausselkä Geopark encompasses six municipalities in the region of Päijät-Häme, in southern Finland, one hour by train from Helsinki. The region is a part of Finland's Western Lakeland, and includes a national park situated in the southern part of Finland's second largest lake, Päijänne. The geopark's borders follow the administrative borders, covering an area of 4 500 km² with some 178 000 inhabitants.

Lahti University of Applied Sciences started the Salpausselkä Geopark Project in 2017 (based on a preliminary project in 2016) with Geological Survey of Finland and Metsähallitus Parks & Wildlife Finland as project partners. The project is funded by the EU Fund for Rural Development and carried out in close co-operation with the municipalities and other local actors. The activities include geosite inventory (focusing mainly on geology, but also nature types and indicator species; including underwater inventories), developing the geosites, networking with the Finnish and global geopark community, active participation in the regional network of environmental educators, and various communication activities (e.g. establishing a website and social media). We have presented the geopark concept, the geological history of the area and the project in dozens of meetings with stakeholders (e.g. teachers, students, civil servants, decision-makers, active people from various associations) and on different public occasions, outdoors and indoors, and we have seen people become interested and inspired. An important part of the project has been the building of a business co-operation network, starting at an early stage in autumn 2017, to develop sustainable geotourism. The network of co-operating enterprises has been growing, and other local and regional actors, such as the local guides' association and groups of nature guide students, have come along. We have organised seven meetings for the network to share knowledge of sustainability and geological heritage, and to encourage co-operation and the development of new geotourism products.

As a result of the project, the municipalities have decided to take part in the permanent functions and basic funding of Salpausselkä Geopark. The geopark's management is being established as an independent unit within the regional tourism company, owned by the municipalities. The geopark is preparing an application to be submitted to UNESCO in 2020.

TERRITORIAL MARKETING AS A TERRITORY PROMOTING STRATEGY: THE CASE STUDY OF THE ESTRELA ASPIRING GEOPARK

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Keywords: Territorial marketing, Strategy, Promotion, Estrela Aspiring Geopark.

A Geopark is, by definition, an eminently territorial development strategy whose premise is to place geology at the service of population development. In this sense, the management strategy of a Geopark is based on its ability to interconnect this heritage with all the assets that co-exist and guarantee its identity, starting from the valorisation of the endogenous resources and culminating with the increase of the sense of belonging by the populations.

The UNESCO Global Geopark classification, created at the beginning of this century for low-density territories, allows, through its underlying territorial development strategy, the construction of a strategic path for a territory, in which residents play a fundamental role in defining the place's identity, contributing to its "personality".

In this sense, this territory composed of 9 municipalities, with 2,216 km^2 and about 150,000 inhabitants, diagnosed as a low density territory, and strongly marked by high levels of population aging, presented the application dossier to UNESCO Global Geopark on November 23rd 2017, with the objective of contributing to the reversal of these trends through the creation of new development strategies.

As part of the management of this Geopark, the Territorial Marketing Plan of the Estrela Aspiring Geopark is being developed, starting with its geological heritage of international relevance, based on the landforms left by last glaciation whose maximum occurred 30 thousand years ago, and working it in a holistic way with all the material and immaterial resources of the territory, such as culture, heritage, history and symbolism, defining concrete actions that can contribute to strengthen the identity and sense of belonging of local communities, resulting in sustained economic growth.

Thus, the development of the Territorial Marketing Strategic Plan is a first step towards tackling the challenges of reversing low density trends, aging population and lack of opportunities for the new generations, since this instrument is an integrated tool that calls for concertation between public and private entities, promoting and exploiting the potential of the territory and mitigating its weaknesses, contributing to an increase in residents, visitors and investments.

As such, the purpose of this communication is to demonstrate that an application to UNESCO Global Geopark is, in itself, a territorial marketing strategy, based on its territorial framework and the analysis of the major questions that are posed to its development, including an internal and external diagnosis to their potentialities and weaknesses, confronting them with the traced diagnosis and with the opinion of local actors. From the crossing of this information, objectives and strategies can be created to contribute to the development of a territory, leveraged in its uniqueness and identity, allowing the creation of a structured offer, not only in what the territory has to offer but above all, in the experience it provides.

THE UNESCO GEOPARK CANDIDACY OF THE ARMORIQUE NATURE PARK (FRANCE)

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Keywords: Armorique, Nature park, Geopark application, Brittany, geodiversity.

The Armorique Nature Park, located on the western part of Brittany (France), is a candidate for membership of the prestigious UNESCO Global Geoparks Network and intends to apply for membership by November 2019. The local geology has left its marks throughout the territory, shaping the identity of the Armorique Nature Park and contains real treasures. Because of its geological history and natural wealth, this area has an exceptional geological heritage and is witness to the strong links that unite man and his environment. The recent creation of a Geological Nature Reserve on the Crozon Peninsula and the Minerals House highlight these spectacular geological features and landscape diversity. It is precisely to promote this remarkable heritage that the Armorique Nature Park intends to apply for membership of the UNESCO Global Geoparks Network and could thus become one of the first Geoparks within the French Atlantic area.

The Amorique Nature Park is a partner in the Interreg Atlantic Area Project: Atlantic Geoparks together with partners from England, Ireland, Portugal and Spain, and the project is a key component of the candidacy for membership of the UNESCO Global Geoparks. The Park is also supported by municipality communities, the Brittany Region and the Minerals House to carry out this important work for the territory. The renown of the "global Geopark UNESCO" label will therefore be a real asset for the Armorique Nature Park by enhancing its attractiveness and reputation while highlighting its geological features through the values and vision shared by UNESCO. The oral presentation has the following objectives: (i) present the territory of the Armorique Nature Park from the perspective of its geological, cultural and natural heritage; (ii) report on the work done so far in relation to the application for membership of the Global Geoparks Network; and (iii) demonstrate that this exceptional territory could find its place within the UNESCO Global Geoparks Network.

THE ISLAND ARC CREATING CULTURE

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Keywords: Island arc, Fjords, Culture, Diversity.

Geopark Sunnhordland was accepted as Norwegian Geopark late 2018, and is aspiring to EGN membership in 2021. Sunnhordland is a region of 8 communities on the west coast of Norway, representing a cluster of islands between the outlet of the Hardangerfjord and the open North Sea.

The Geopark focuses on the 1800 km^2 area on the north side of the fjord, a remnant of an island arc system 495 million years of age and containing rocks utilized by humans for 10.000 years.

Nomads came here 11500 BP when the great Scandinavian ice sheet had released our coastline from its cold embrace. Their axes and arrowheads was made of flint, but flint is sparsely found in Norway and never as part of solid rock. Local rocks soon became alternatives. Greenstone from a remote and small island was utilized as axes for 6000 years in the Mesolithic and Neolithic culture, identifying the "greenstone clan" on the west coast during this vast period of time. Soapstone is used as building stones in medieval churches, a Norwegian speciality. Marble has been used for the production of lime for 900 years but also as a building stone in royal buildings in Denmark during the 18th Century. We have a number of pyrite and chalcopyrite mines from 1860's and gold mines from late 1800. Finally our granite was a dominating building material in the city of Bergen and Sunnhordland from 1860-1960.

The Viking sagas refer to Sunnhordland as the arena where the baptized Viking kings first came to implement Christianity in Norway around 1000 AC. The volcano-shaped mountain Siggjo, being a famous sailing mark, has always allured humans to its shores.

An Ordovician island arc system born in the Iapetus Ocean, south of Equator, now situated on the north side of the Hardangerfjord, is the main geological foundation for Geopark Sunnhordland. The long tradition of human use of a diversity of rocks related to this system is our prime concept. Also the Hardangerfjord, dug out by numerous glaciers along the boundary between the island arc rocks and the Baltic shield, gives a perspective of time in our story-telling.The Baltic granites on the south side of the fjord are 1.3 billion years older than the subduction related granites on the north side. As a curiosity it should be mentioned that the oldest mineral of Norway is found within the Geopark. The zircon is 3.9 billion years old, found in sediments eroded from the mountains of Laurentia and brought to Norway by thrusting during the Caledonian Orogeny when Laurentia and Baltica collided. The mineral is now a hardy passenger with a story to tell almost 4 billion years after its birth.

This is memories of earth. Highlighting the contexts and strengthening our knowledge gives affection and sustainability for the landscape and future for people.

ROCKS IN ARCHITECTURE AND THEIR USE IN EDUCATION IN ASPIRING ŒWIÊTOKRZYSKI (HOLY CROSS MOUNTAINS) GEOPARK

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Keywords: Poland, Holy Cross Mountains, education, rocks in architecture

The area of the aspiring Świętokrzyski (Holy Cross Mountains) Geopark is situated in the south-west part of Poland. The Geopark area plays an important role in geological research works and in education of Earth sciences on an international level. Exceptional geodiversity is reflected in the occurrence of different sedimentary rocks representings almost all geological periods from Cambrian to Quaternary on a relatively small area. Sedimentary rocks (limestones, conglomerates, sandstones) occurring at the geopark's area, have been used in architecture for many centuries.

A characteristic feature that is observed in this area is the use of grinded and polished carbonate rocks (limestones, conglomerates) in architecture. The beginnings of this process date back to the sixteenth century. Rocks subjected to this type of treatment are called technical marbles, so-called, świętokrzyskie marbles'' or, chęcińskie marbles''. It is worth adding that in the geological sense, they cannot be called marbles, only after the treatment visually resemble marbles and are sold under that name. In virtually every historic building from the 17th-19th centuries in Poland, you can meet elements made of stone from the geopark. Technical marble is particularly visible in the Holy Cross Mts. Region.

Tourists visiting Geopark has the opportunity to meet the geological heritage not only wandering in the field and visiting old quarries or natural rock exposures. This can be done during a visit to the oldest parts of cities, towns and villages. For example, the floor, walls or portals of the Kielce Cathedral, were made of Devonian limestones with numerous fossils of corals and sponges that is a record of a shallow tropical sea.

The widespread use of rocks in architecture is also an excellent base for geological workshops within the framework of geopark activities. Regional tourist guides are trained by the geopark. While guiding the group, the guide not only has to tell group about the history of the object, but also to tell about the history recorded in the rocks.

Geopark as part of its educational activities organize also tours connected with the use of rocks in architecture. There are also organized field games (questing) during which their participants have to solve puzzles related to the topic of rocks used in architecture.

Currently, the tradition associated with grinding and polishing is slowly disappearing in the region. Owners of local quarries will switch to the production of cement, lime or aggregate for economic reasons. However, as part of its activities, the geopark wants to maintain this unique regional tradition. As part of the workshops at the geopark's educational center, their participants have the opportunity to polish a piece of Devonian limestone. The limestone used during the workshop is waste from local mines, which are obtained free of charge. If they did not get to the geopark, they would be converted to aggregate or cement. Thanks to this, the workshop participants make souvenirs for themselves, and they learn about regional stonework traditions and connections between geological and cultural (industrial) heritage.

LAND OF EXTINCT VOLCANOES – ASPIRING GEOPARK FROM POLAND

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Keywords: Aspiring geopark, Volcanic, Sustainable Development.

Land of Extinct Volcanoes is an aspiring geopark from south-west Poland. It is located in western Sudetes, in the region of Kaczawskie Mountains and Foothills. It is distinguished from other regions of the country by significant geodiversity related to its long (over 500 Ma) and complicated geological history. Particularly interesting is that in this small region, there are volcanic and metavolcanic rocks representing three episodes of volcanism of ages: Early Paleozoic (submarine), Permian and Cenozoic.

Geographically it is a remote, peripheral region, with no big industry, located far from big cities and main transit roads and until very recently, not considered attractive for tourism. The latter has been changing gradually when local activists and leaders started to promote it under the regional brand: Land of Extinct Volcanoes. It has brought attention of the local governments and media, attracting more visitors every year.

The whole process is being coordinated by Kaczawskie Association, a regional NGO that since 2007 has been implementing projects and programs dedicated to sustainable tourism, rising regional identity, promoting and protecting local natural heritage. It is a partnership hub, bringing together businesses, municipalities, small organizations and communities to focus on a common goal – sustainable development of the region. Since 2015 it also conducts an interpretation center called Sudetic Educational Farm, which accommodates an interactive exposition and employs five geologists/geographers to inform and educate the public about the geodiversity of the area. It hosts around 17.000 visitors per year, 60% of which are school children and youth.

With the help of Local Action Group “Kaczawskie Partnership”, Kaczawskie Association will apply to UNESCO Global Geopark in 2019.

ASPIRING SAIMAA GEOPARK, FINLAND: TOWARDS WIDER CO-OPERATION IN FINNISH LAKELAND AREA

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Keywords: Aspiring Geopark, Regional development, Finnish Lakeland Statement

The Saimaa Geopark Association, funded by nine municipalities, is the organization that aim is to achieve the UGGp status to its area in the southeast Finland. The co-operation which these municipalities have been doing under the name of aspiring Saimaa Geopark, has generated wider collaboration in the Lake Saimaa area in order to develop both regional vitality and sustainable use of natural resources.

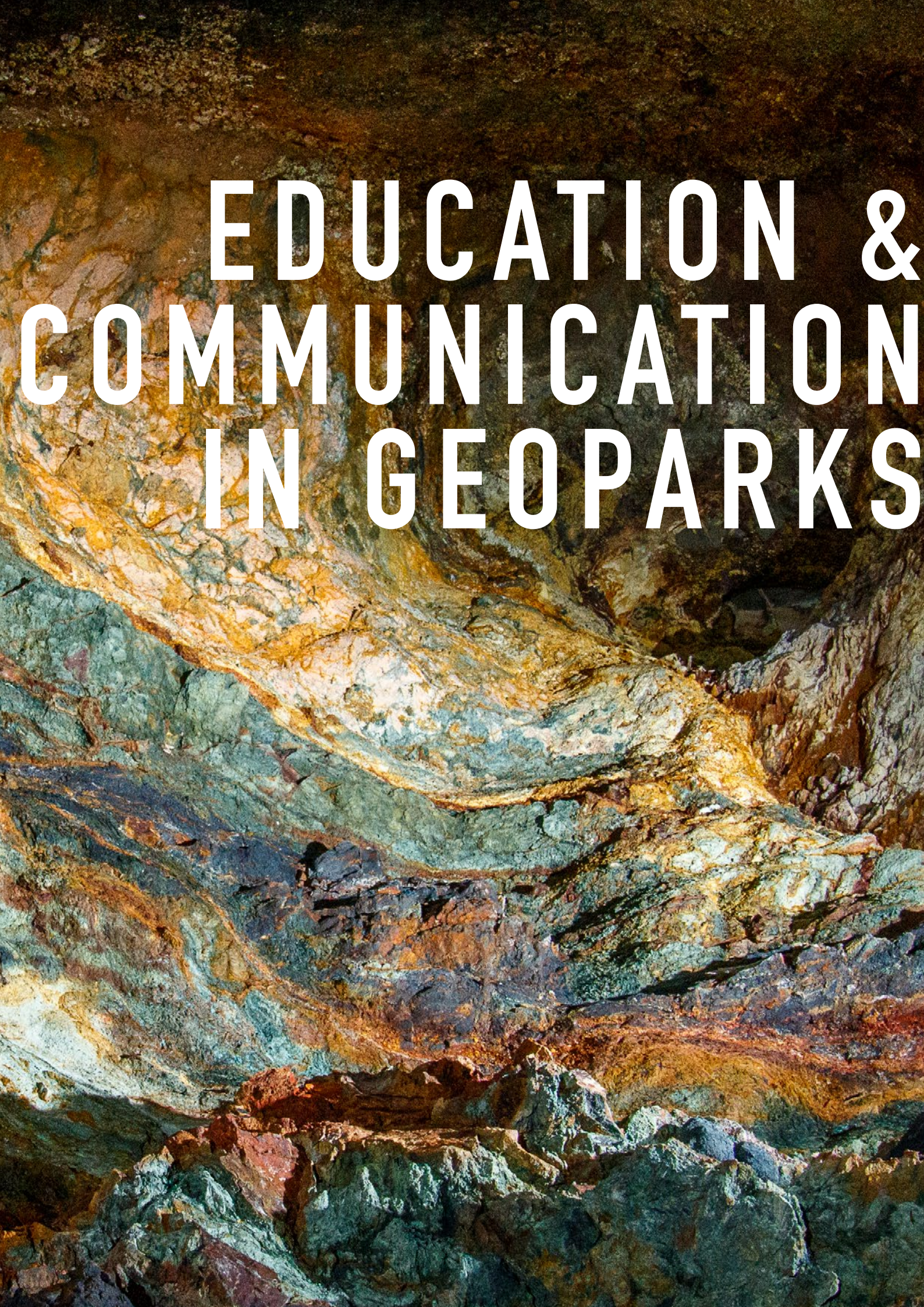
Lake Saimaa is the fourth biggest fresh water lake in Europe. From south-to-north the whole Lake Saimaa area is 300 kilometers long, and from east-to-west the area is more than 100 kilometers wide. Lake Saimaa is consisted four different lake systems: in addition to Grater Saimaa the water systems of Kallavesi, Pielinen and Höytiäinen are part of Lake Saimaa. There are more than 30 municipalities and four provinces which are located in the shores of "Saimaa". All together the surface of Lake Saimaa area is approx. 27000 km^2.The area of aspiring Saimaa Geopark is less than fourth of the whole Lake Saimaa area (approx. 6100 km^2).

The work which nine municipalities have been doing in order to gain UGGp status has encouraged to create further objectives to develop local/regional vitality in the whole Saimaa area. Actors of the aspiring Saimaa Geopark have been active to carry out wider statement to build up local-regional development in eastern Finland.

From the initiative of the City of Mikkeli, we gathered a working group to run an objective that did concretized in June 2019: leaders of the over 30 municipalities, four provinces and four administrative organizations singed a "Finnish Lakeland Statement" - the Statement is aimed to strengthen the objectives of responsible development and tourism, industrial vitality, academic research, clean tech and Research & Development and services of water conservation.

The Finnish Lakeland Statement doesn't restrict but stimulates new ideas and ways for production, conservation and activity equally in the area of Lake Saimaa.

In this presentation, the social and ecological influences of the work of aspiring Saimaa Geopark is to be presented in the wider geographical framework and from the viewpoint of local/regional vitality and sustainable development. The paper argues that the work which is aimed to achieve the UGGp status, can be put as a starting point of the wider regional development - in this case to profile the whole eastern Finland. The aims of UGGp process can be adapted to the top of regional development even outside of actual Geopark area.



EDUCATION & COMMUNICATION IN GEOPARKS

FROM SCIENTIFIC RESEARCH TO ENVIRONMENTAL EDUCATION: THE EXAMPLE OF "BIOMITI" PROJECT

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Keywords: Environmental Education, Scientific Research, Communication.

The Environmental Education is an institutional activity of the Adamello Brenta Nature Park, the management body of the UNESCO Global Geopark. We can say therefore this is one of the fundament of the Adamello Brenta UGG. In fact, to educate to a sustainable use of the environment is the best way to be effective on its protection. We can state that through the environmental education we try to give people a "manual" to live Nature in a respectful way and also intensely, but without destroying or spoiling the different components. For us, "to educate" means telling the beauty of the Adamello Brenta territory, and starting from it, we can give people an idea of nature conservation. This can be useful for visiting other natural areas and moreover in the daily life through little changes in behaviours that can help the planet ecology. In this context, the Adamello Brenta UGG reorganized its departments, merging the Environmental Education office with the Scientific Research office, with the aim of bringing into the environmental education what comes out from the scientific research on the field. The environmental monitoring are at the basis of the Adamello Brenta Nature Park and Geopark: we strongly believe that it's impossible protecting without knowing. At the same time, it's evident that the knowledge of the environmental aspects is a resource to communicate and spread to people as an educative value, useful to live natural environments in a sustainable way, i.e. letting them complete and intact for the next generations. To favour this, the Adamello Brenta has a team of close-knit workers well experienced and who know very well the territory of the UGG.

To put into effect the above, in 2018 the Scientific Research Environmental Education office developed a new project, called "BioMiti", bearing in mind the wide goal of bringing the scientific results into environmental education activities. For this reason it has an holistic approach and combines different disciplines, creating new collaborations among different research bodies and Italian Universities. The scientific aim of the project is the one of studying the ecosystem in the Brenta Dolomites, with the goal of understanding the effect of climate change on alpine environment. The multy-year study investigates an area between 1900 m and 2900 m of altitude, focusing on fauna, flora, climate and also on geological/geomorphologic aspects that are at the basis of the ecosystem and able to influence bios. All the data collected, thanks to detailed scientific analysis, will help to understand better the effects of climate change and to find ways to mitigate them.

So, a double aim of BioMiti project: to know and to let know. The UGG developed several educational activities starting from this scientific research, addressed to school children who, besides being sensitive and representing the future for our Planet, can also bring these ecological themes to their families. Various activities have been addressed also to the target of tourists, who can arise their awareness of the fragility and the importance of respecting our Planet Earth through these experiences.

"CLARA AND THE STAIRS OF TIMES": THE LOCAL GEOLOGICAL HISTORY AS A SUPPORT FOR A PARTICIPATORY CULTURAL PROJECT

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Keywords: education; culture; participatory approach.

"Clara and the Stairs of Times" is a musical geo-tale created between 2017 and 2018 in the Causses du Quercy Geopark (France). It is above all a human adventure where artistic creation and geological history are intertwined, involving volunteers, musicians and non-musicians, the young and the not-so-young alike...

This project was born from a local initiative, imagined by two local artists: a scriptwriter and a composer. Their idea was to draw inspiration from the Geopark's geological history to create a musical show by relying on the inhabitants. They presented their project to the Geopark team, who were immediately enthusiastic about it and decided to support it, and even to associate itself with it.

The first episode of this adventure was to create the story itself. A 4-day camp for 11-15 year olds was organized in July 2017 with 13 participants. The children visited several geosites and met a lot of people who explained to them the geological and paleontological heritage, told local tales and helped them discover local music. All of this material fed their creative work, both on the story and the musical side. On this basis and with a great respect for the spirit of the young creators, the two artists finalized the composition and the writing of the musical tale during the summer. The second episode consisted in the creation of the show itself under the direction of a soundpainting conductor. An eclectic group was formed with all the volunteers interested in the project: children as well as adults, musicians – mostly from a partner local music school – and "ordinary" inhabitants…

During the winter and spring 2017-18, those 3 artists and 25 participants aging from 7 to 67 years old met for several workshops of 2 to 3 days each. They worked together on the staging of the story and learned the soundpainting language with which the musical writing of the show-performance was designed. A unique representation of "Clara" was shown at the end of May 2018 for the European Geoparks Weeks and also to celebrate the 1st anniversary of the Global Geopark UNESCO's label; 130 spectators attended.

This ephemeral adventure will remain on an audio CD, but more significantly in the memories of the participants and public alike. If one might question the effectiveness of this action– energy and money spent for a one-shot representation – we should not forget its exemplary nature as a truly participatory approach and the social and intergenerational link it has created. If geological history can become a true support for artistic and cultural experimentation, we may be touching the "real geopark" spirit!

EDUCATIONAL KIT FOR SCHOOLS TO PROMOTE THE GEOPARK AND STRENGTHEN THE EARTH SCIENCES

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Keywords: education, schools, Earth Sciences, Geopark.

UNESCO Global Geoparks are territories based on different pillars of which education is essential to raise awareness, foster self-esteem and respect to the geological heritage. By using educational programs, young generations can be stimulated to study Earth Sciences, keep living in the Geopark and become its custodians. Unfortunately, nowadays in primary and secondary schools curricula, Earth Sciences disciplines are very poor treated and rarely include examples of the territory. Therefore, Conca de Tremp-Montsec UGGp, together with other local education institutions and the collaboration of 6 Geoparks, elaborated an educational kit addressed to students from 10 to 14 years old.

The objective is to promote the values of the UNESCO Global Geoparks, the geological heritage and its links with the social and economic development by using the examples pictured in the Geopark. To make it available to the educative centres, it is offered through the Pedagogical Resources Centres (CRP) of the area.

The didactic kit contains seven interdisciplinary activities that deal with different topics such as stratigraphy, mining or natural disasters from the last 220 million years of the Geopark history. The activities contain a final application exercise linked with a cinematographic technique like the story board or the original soundtrack. Therefore, in each activity, students apply the scientific method and can connect their previous knowledge with the one they acquired linking geology and cinema. Finally, they can make a film, which allows them to share their knowledge and promote the territory to the local people as it can be projected at Mostremp, the rural film festival in Tremp, in partnership with the Geopark, and other media.

For this reason the kit is called “Un Geoparc de Pel·lícula” that is literally translated as “A Film Geopark” and means a dreamed-of place. It also refers to the geological history of the area and the final product of the project which is a film.

During the first implementation, 2018/2019, a total of 171 students of 4 high schools and 1 primary school have used it and two groups made the film. Besides, a monitoring was carried out to collect information for this first usage and the teachers’ evaluation was very positive. They found the activities useful to complement and give a local approach to the general topics they tackle in class. As a result, the kit is going to be replicated due to the high demand.

CELEBRATING THE GREEN CARD IN THE BASQUE COAST GEOPARK: WE GOT IT!

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Keywords: Communication, sustainable development, development for future.

In the Basque Coast Geopark we are convinced that the participation and involvement of the local population is fundamental for the sustainability of a Geopark. Since the Basque Coast Geopark joined the Global Geopark network in 2010, we have undergone two revalidations, in 2014 and in 2018.

The integration in the network was a slow and hard process, we had to convince many people, politicians at different levels of administrations to design and agreed to, a model of Geopark according to the reality of our possibilities offered within our territory. The result of the evaluation was successful, and the proposal was accepted in 2010 into the EGN and GGN networks. The entry in the networks caused a huge impact on the media and a great excitement and expectations within local people.

In 2014 we obtained very good evaluation (green card) which also had a big impact on the media. 2018 was a revalidation year as well, however, the general feeling was not euphoria, given the good results became routine. To face this situation we decided, to give the attainment of the green card the importance it deserved, and to make local people feel proud of the Geopark.

We designed an innovative marketing action aimed at the local population called Geo-quotes. First of all, we checked the social media and other forums looking at the positive posts the visitors had written about us. Secondly, we chose emblematic places in our streets to write these quotes. Theses quotes were written on the ground with green paint during the night and the next morning the locals awoke to the streets, this causing surprise and uncertainty among many people.

Later, we loaded a video on social media where people read the quotes and made a video about how the night painting happened. Finally, both to strengthen the action and to reach those people with no skills in digital media, we designed green cards shape like post cards and put them in 9.000 post boxes around the Geopark, where these quotes were written also.

This initiative helped to make the population aware of the green card and to reclaim the importance of what they have been achieved.

UNESCO GLOBAL GEOPARKS AND FORMAL EDUCATION: WHAT IS BEING DONE?

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Keywords: UNESCO Global Geoparks, geosciences education for sustainability, educational programmes, formal education, questionnaire.

In order to characterize the role of UNESCO Global Geoparks (UGGps) on the promotion of educational activities for schools (formal education), a questionnaire was prepared and sent to all the 127 UGGps (data as of May 2017). Seventy-three UGGps from 35 countries completed the questionnaire by December 2017 and the preliminary results are here presented.

1. Educational activities at UGGps are organized by their educational department. In cases where it does not exist, it is the scientific or executive coordinator of the geopark who is responsible for these activities. In both cases, the responsible for educational activities have an academic background in geology, as well as the monitors involved in these activities.

2. Most schools that participate in educational activities are located inside or near the geopark. Students with ages from 6 to 18 years old are the most common beneficiaries of the educational programmes offered by geoparks.

3. Educational activities are usually part of the UGGps's annual planning and are available in pre-defined and "à-la-carte" packages. The most common activities for students have half-day duration and are: field trips, workshops, celebration of environmental theme days, exhibitions in interpretation centres and pre-field trip classes. Among the activities addressed to teachers, the most frequent are field trips and training courses. The funding comes primarily from the geopark's budget, followed by the local and regional/state administration.

4. Most geoparks promote activities adapted to different school levels and some disciplines of the national curricula (biology, geology, and geography). They also promote interdisciplinary activities. Of the 17 Sustainable Development Goals (SDGs) (Agenda 2030) the most explored in educational activities are (in descending order): 4 – Quality education; 15 – Life on land; 11 – Sustainable Cities and Communities; 13 – Climate action; 3 – Good health and well-being. Presentations, documentaries, and videos are the most common educational resources used in geoparks.

5. Most geoparks assess the educational activities promoted by them and highlight that the greatest difficulty in managing and organizing actions is the reduced funding. In order to improve these activities, geoparks consider as extremely important a stronger involvement of teachers of the geopark's schools, the establishment of a network of partner schools and the increase of cooperation with other geoparks.

This overall characterization of how UGGps are working with formal education will allow the development of a methodological proposal to promote the implementation of educational programmes in UGGps and aspiring geoparks.

QUALITY CERTIFIED ENVIRONMENTAL EDUCATION IN ASPIRING SALPAUSSELKÄ GEOPARK

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Keywords: environmental education, outdoor education, geo-education, Finland, aspiring geopark.

The Salpausselkä Geopark project area encompasses six municipalities that are home to some 178,000 inhabitants. The aspiring geopark is located in southern Finland, one hour from the capital city Helsinki. City of Lahti with 120,000 inhabitants is a major stakeholder and plays an important role in building the geopark in cooperation with other municipalities and the Salpausselkä Geopark project working with a wide range of regional and local actors.

The City of Lahti Environmental Department has two full-time environmental educators who work with the staff of kindergartens and schools, and with children and youngsters. They develop and organise activities related to the sustainable development goals of the geopark, such as guided tours, lectures and training for those working as educators, and activities for children and young people, concentrating on outdoor education.

The environmental education provided by the city of Lahti has received quality certification for its activities. The criteria for the certificate are set by the awarding body, the Finnish Association of Nature and Environment Schools. Environmental Education development centres must fulfil at least 11 quality criteria to gain certification. These include supporting the aims of sustainable development in early learning and emphasising experimentation and hands-on experiences. The fulfilment of the certification criteria is verified by regular peer reviews.

As part of the Salpausselkä Geopark building process, the city of Lahti has been developing geopark-themed education for kindergartens within the framework of the city's quality certified environmental education. The authors attended an introductory meeting on the topic in 2018 where representatives of kindergartens were enlightened on the geopark concept. Since then the environmental educators have planned and provided the kindergartens with geopark-based activities: children have been able to, for example, simulate the birth of kettle holes using a sand bucket and balloons or ice blocks, and have become familiar with the features of ancient shorelines through activities on location. The geopark's glaciofluvial formations make ideal environments for small children, where they can physically experience the ice-age shaped landscape.
These new geopark-based activities have been met with particular enthusiasm in this region where the children, as well as their teachers and families, now are offered a better understanding of the ice-age carved environment in which they spend their daily lives: in and around a hilly city with tracks for skiing on in winter and kettle ponds and lakes for swimming in summer, drinking the pure groundwater resulting from the Salpausselkä ice-marginal formation.

A GAME OF GEOPARK. GAME-BASED LEARNING OF HERITAGE IN VILLUERCAS-IBORES-JARA UNESCO GLOBAL GEOPARK, SPAIN.

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Keywords: education in Geoparks, game-based learning, heritage.

The conservation and protection of the geological, but also natural and cultural heritage, is one of the main objectives of the UNESCO Global Geoparks. One of the most effective ways to reach this objective is through education.

Geocentros (Geocentres/Geoschools) is the name of the educative project of the Villuercas-Ibores-Jara UNESCO Global Geopark, in Spain. This project involves all the educative centres in the territory and aims to increase the knowledge of the geological, natural and cultural heritage of Villuercas-Ibores-Jara UNESCO Global Geopark, bringing it into the classrooms and converting the geopark into an experience-based classroom capable of fostering inter-centre cooperation. The incorporation of this knowledge will undoubtedly contribute to the conservation of this heritage by society, from school age.

As a result of more than 10 years (even before being declared a geopark in 2011) of intensive and close work between the geopark Educative and Scientific Committee (ESC) and all the geocentres, some educative material has been developed to increase the knowledge of the heritage. We highlights the book of Environmental Studies subject, and the Activity Book ("Geoexperiences") based on it.

However, the dissemination of this knowledge from the formal education to main society –non-formal education, including locals and tourism, is not easy. Game-based learning is a solid tool in education, making the contents and learning process more attractive to people regardless of his age. This is why the ESC has developed new pedagogical material coming for the formal education activities, to be used in both, formal and non-formal education: card and board games based on the heritage of the geopark. In them, the concepts about the heritage (geological time, geosites, birds, villages, fossils, etc.) are implemented in the way of traditional or modern games. In addition, some traditional games are well-known in many countries (Snakes and Ladders, families and couples card games, Game of the Goose, etc.) making them useful for people for many nationalities and cultures. These games has been designed in both regular and big format (2 x 2 m), to be used not only in the educative centres but also in the interpretation centres or by the activity companies in case of bad weather. Some have also become merchandising products in order to provide the geopark with funds enough to maintain the interpretation centres and produce new games.

Welcome to the Game of the Villuercas-Ibores-Jara UNESCO Global Geopark!
Welcome to the Game of our History!

INTERPRETING CULTURAL ASSETS THROUGH TRADITIONAL AND INNOVATIVE EDUCATIONAL TOOLS: THE CASE OF MYGIA TRAIL AT PSILORITIS GEOPARK

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Keywords: Geo-education, geotrails, mobile app, e-geodiscover, Psiloritis.

Predominant economic activity at Psiloritis UGG is the extensive livestock farming of sheep and goat. Strong ethics, behaviors and statuses have been developed all these years related with shepherds' life and activity that are demonstrated in ethical codes, social life and land use. Many indications can be found at songs, products and infrastructure such as the dry stone buildings called mitata. Mygias trail near Anogia runs through a small gorge with the same name, as well as karstic areas and it is mainly used for educational purposes of geopark. A traditional song explains the myth from where the gorge took its name. Together with Anogia environmental education center we have developed a special program for school classrooms that visit the center, to present social life of shepherds' community, cheese making and mitato construction using local stone. The program integrate experiential learning, field visits and live demonstrations, correlating all aspects of nearby environment and culture with the geological back ground.

Recently under the INTERREG Greece Cyprus project titled GEO-IN we developed an educational activity in the form of a mobile application called e–geodiscover that is implemented along a small part of Mygias trail, especially at the small doline and the beginning of the gorge. Activity aims to transfer knowledge about rock properties, karstic erosion, mitato's use and local flora. It is based on the concept of the games "hidden treasure" and was designed as an application compatible with android devices that can be downloaded for free and stored in a mobile device to run, even without Wi-Fi access. Target groups are school children, families and individual visitors of geopark. The concept is to discover geosites and other locations of natural and cultural importance along the trail using a digital map with location tracked through the device's gps. The entrance of device in a predefined buffer zone around the point of interest is identified by the device's gps permitting pop up of introductory information and questions for the site and then of predefined answers in the form of simple phrases, images, or true/false answers. Correct response within two tries enables the appearance of complementary information about the site and guidance to discover the next. Application has the ability to trace players' response and to count the first provided answer per site to evaluate the total performance of the player at the end. The application has also been designed for another geotrail of Psiloritis UGG and for one trail of Sita UGG which is also partner of GEO-IN project.

ROKUA UGGP HAS REACHED ENCOURAGING RESULTS BY STRENGHTENING THE ROLE OF LOCAL COMMUNITIES IN REGIONAL DEVELOPMENT ACTIVITIES

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Keywords: education, local communities, sustainability, regional development

Over the last years Rokua UGGp has actively strengthened the role of local people in regional development activities. It has led to numerous encouraging outcomes like new events, attractions and even products celebrating the Geopark´s geoheritage. The results have benefited the whole Rokua UGGp area. Prerequisites for the outcomes have been to get local people realize the uniqueness of their home region and to get them feel proud of participating in development of the Geopark.

Since year 2013 Rokua UGGp has arranged several environmental education courses together with folk education centres for local people. Especially field trips to local and "hidden" sites have been very beneficial for further cooperation with local communities. The themes and visiting sites for the courses have been planned together with locals, and contents together with professionals from the Geopark´s stakeholders.

Rokua UGGp has also found new attractions together with local landowners, municipalities and professionals. For example, a simple but imposing gneiss outcrop site equipped with high quality information boards has woke up local´s interest towards geology and led to a successful story of regional development: The locals have begun to use the site for several purposes like public events and courses and even invited press to visit the site. The newest outcome is a GneissRock festival arranged by a local entrepreneur close to the outcrop. Neighboring villages have also become inspired about the local geological history, and Rokua UGGp has assisted them to find the most relevant sites and ways to tell out the stories. The most impressing result is a rock exhibition made by a local museum association together with Geological Survey of Finland.

During the last few years Rokua UGGp has also published new information tools like a mobile application, brochures and information boards presenting the area and the key attractions. The information tools were prepared together with local communities. During the development meetings the representatives of the communities considered the best local attractions and services to be published in the guides and boards. They also gathered old stories and legends from the nearby region. Thanks to the local inhabitants the completed guides share multidimensional information beginning from the geology of the region and ending with cultural legends and myths associated with the paths and geosites. Contributing to the preparation process and to the contents of the guides increased the Geopark's inhabitants´ sense of pride in their home region.

Rokua Geopark tells the history of the last Ice Age and the outstanding landforms shaped by the melting glacier. Underlaying bedrock consists of Archean and Proterozoic rocks representing the oldest bedrock area in EU. Rokua UGGp also includes fascinating cultural sites which have a history dating as far back as 8500 years.

ANOTHER BORING PANEL?

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Keywords: Communication, Interpretation, Sustainable development.

"Another boring panel?" – of course not! The area of your geopark is full of exciting geology, wildlife, architecture, intangible heritage etc, etc… and you find it really interesting. Not boring at all!

But people do not read panels. Correction: most people do not read most panels. The research has been done (e.g. in the Azores UNESCO Global Geopark – and many other places around the world). You need to time how long it takes to read your new panel, then stand back and count the time visitors spend looking at it. Most do not spend the necessary time. So how do you make sure that most visitors get to enjoy the wonderful information you want to share about your world-class geopark (it has to be world-class or UNESCO will not accept it as a Global Geopark. Simple!). And how do you make sure that people also read the safety message, and also behave in the way you want them to? And even if they chose not to read much they still get to read your key 'take-home' message?

Over 60 years ago Freeman Tilden wrote about communicating to visitors to the national parks in the USA. The US National Parks Service still uses his ideas. His key message was "Provoke, relate, reveal". Nowadays we have a vast amount of research which gives the scientific basis for the ideas he worked out by intuition and observation. And nowadays we have much more colourful ways to present the information, as well as many alternative media to back up the message, or, indeed, to provide more information for those who want it.

So why are so many 'boring' panels still being put up? And posted proudly on Facebook. But not read by visitors.

This presentation will aim to show how you can condense 3.5 billion years of Earth history into just a few seconds of a human's life. And have that human visitor wanting to spend a couple more minutes of their precious life finding out more about your geopark. And wanting to protect and treasure it – just like you do. That's sustainable development. "Memory of Earth, future for people" is the theme for this conference.

And if you only have 100 million years of history in your geopark? – well, relax, you have got it easy!

CELEBRATING THE ANNIVERSARY OF THE PERIODIC TABLE – THE DISCOVERY OF THORIUM IN GEA NORVEGICA UNESCO GLOBAL GEOPARK

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Keywords: geoscience communication, natural and cultural history.

The Periodic Table is celebrating its 150 years anniversary in 2019 and Gea Norvegica UNESCO Global Geopark using this opportunity to spread information about the discovery of a new chemical element by developing a new geopark attraction.

In 1828 a brown, a bit shiny, mineral was found on a small island outside the town Brevik. The brownish crystal was found by a priest, Morten Thrane Esmark. He was son of Norwegian geologist and mineralogist Jens Esmark and together these two decided to send this for them new mineral to the Swedish chemist J.J. Berzelius.

Not only was the tiny brown crystal proven to be a new mineral, it was also containing a new element. Berzelius named the mineral thorite and the new element was called thorium. This names were given as an honor to the Nordic god Thor.

The small island Løvøya is close to the border of the Permian Oslo Rift volcanic province. This area is well known among mineralogists as Langesund Fiord mineral province, an area famous for the richness of different minerals. Several minerals are found for the first time here, some are even found exclusively in the area. The rocks are mainly larvikites and nepheline syenites.
The hosting rock, a nepheline syenitic pegmatite is a very typical occurrence in the surroundings of Løvøya and several of the pegmatites in the vicinity bear evidence of an intensive hunt for the newly found brown treasure – the thorite containing thorium. In the late 1890ties something like a Klondike situation developed, since thorium showed to be valuable for the improvements of gas lamps. The introduction of electricity brought the mineral hunt to an abrupt stop. Today the interest for the radioactive element thorium is growing, due to the research for a cleaner atomic energy production.

In the light of the Green Shift and the society of today's need for different minerals we focus upon the geological processes, the interesting story about the discovery, the society's need for products form the Earth's crust in during the 19th Century and the myths and stories connected to natural history in our new geosite. The island is accessible by private boats and a seasonal ferry and is an exotic, new locality in our geopark, developed in cooperation with the municipality of Porsgrunn and the local branch of Norwegian Chemical Society.

NEW GEOENVIROMENTAL EDUCATIONAL TOOLS OF CILENTO, VALLO DI DIANO AND ALBURNI NATIONAL PARK UGGP

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Keywords:Geo-biodiversity, educational, digital tools.

In the territory of the Geopark beside the existence of a network of paths (about 1500 Km), mostly marked according to the modalities of the Italian Alpine Club, and partly equipped with didactic panels, system of signs, rest areas etc., there is also a network of about 41 Museums (archaeological, geological, paleontological, about the country civilization, about Sea, an Antiquarium etc). Particularly there are two new museums, managed directly by the staff of Geopark, that in the last few years have obtained positive outcome in the Geopark's schools.They are Villa Matarazzo Museum in Castellabate and the Geo-biodiversity Museum in Vallo della Lucania. In the area of Castellabate, little village facing the sea, there is an ancient building restored, Villa Matarazzo, and two new building in the same historical structure. The ancient villa houses the Office of the Geopark and of the Marine Protected Area "Santa Maria di Castellabate" and a room with a 3D video on submarine environment. The new buildings house the aquarium (working in progress) and a geodiversity museum where three diorama show three typical Cilento Geopark's environment: 1) a fluvial one with a narrow gorge; 2) a karst landscape with doline and 3) a costal dune environment. Museum of geo-biodiversity of the Geopark. This museum consists in several sections dedicated to different geological features and their connections with flora, fauna, cultural, archeological and historical heritage. On the first floor of the building you can find geo-biological interactive map of the Geopark. In the same room there is an holographic display where you can explore the UNESCO world. Along the stairs leading to the lower floor, the entrance to the center of the earth is simulated. In the lower level you can see the exhibit typical features: a 3D room, where 3D images and videos create an optical illusion, changing the space around viewers to transport them into a 3D virtual dimension; an holographic interactive table, showing the geosites and biotipes (description, photos and videos); explanatory panels and three-dimensional models where the karst system of Geopark is simulated. This museum represents the center of the museums network of the whole Geopark and it wants to be the starting point of a fantastic travel into its territory.

THE ESTEAM PROJECT AND THE MOBILE APPLICATION "TEACHOUT – OUTDOOR SCIENCE GAME"

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Keywords: ESTEAM Project; App TeachOUT; Outdoor Science Game; UNESCO Global Geoparks; Educational Programmes.

The ESTEAM project (*Enhancement of School Teaching Methods by linking schools, experts and Geoparks combined with outdoor activities and ICT technologies)* is co-financed by the ERASMUS + Programme of the European Union. It started in September 2016 and finished in August 2019. The coordination of the project is carried out by the Idrija Tourism Board, the coordinator of the Idrija Geopark activities. There are seven project partners - three UNESCO Global Geoparks (Idrija, from Slovenia, Magma, from Norway and Naturtejo, from Portugal), two schools within the Geoparks areas (Crni Vrn Primary School and the José Silvestre Ribeiro Schools Grouping, Idanha-a-Nova), the University of Ljubljana (Department of Geology) and an ICT company *Locatify* (Iceland). The target groups of the Project are Natural Sciences teachers, future Natural Sciences teachers, Professors of didactics at Faculties, pupils aged 12-15, Geoparks staff and employees of educational institutions.

Three ebooks have come up from this project: 1 – Research of the National Curricula in Natural Sciences Teaching in Portugal, Norway and Slovenia: Results analysis with guidelines; 2 – Development of the ESTEAM Teaching Methodology; 3 – Guide for Outdoor Teaching in Natural Sciences – ESTEAM Methodology – TeachOUT Science Outdoor Game. These ebooks and all the information about the project are available at: www.esteamproject.eu.

The main result of this project is the mobile application "TeachOUT - Outdoor Science Game". The common topics selected from the national curricula of Natural Sciences in the three countries in order to create the app were: 1 – Man's Impact on Earth; 2 - Ecosystems; 3 – Geology. TeachOUT app and its mobile platform for teaching/user experiences were developed and then tested by students in each of the three countries, on a selected trail, integrated in the territory of the partner geoparks. Additionally, an intensive training course was organized on the app for the technicians of the project partners. These technicians promoted Multiplier events for presentation the project and the app for teachers and collaborators of their geoparks. This multidisciplinary educational tool allows geopark teachers and monitors to select locations in nature, create their own games, exercises, add a number of multi-sensory contents (e.g. treasure hunts, questionnaires, observations, audio, work with maps, photos and videos). By using the app, students learn about nature in nature, to make their own decisions, to observe the environment, to act responsibly in the environment, to communicate with colleagues, to work in groups, to be creative in thinking and to use modern technologies in learning. The TeachOUT is available for download from the Play Store and the App Store. The ESTEAM teaching methodology and TeachOUT app are an asset for UNESCO Global Geoparks to use in their educational programmes.

USE OF DIGITAL MEDIA AND TECHNOLOGIES BY THE ASPIRING GEOPARK RIES

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Keywords: Interactive map, Geotope cadaster, Website, Audio tours, Progressive Web App

The Aspiring Geopark Ries encompasses an area of about 1,750 km². Its border is defined by the crater formed by an asteroid impact and the resulting ejecta blanket still preserved today.

Collection and digital representation of geospatial data: The entire Geopark is uniformly cartographically prepared and presented on the website as an interactive map—with topological as well as geological depictions.

Geological features and other sites of interest are collected as point data in various layers to be superimposed on the map as the user desires. The National Geopark Ries used the digital geotope cadaster of the Bavarian regional authorities as the basis for its inventory of geological features. Geotopes of the Baden-Wuerttemberg cadaster were added manually. In a third step, the combined geotope cadasters were supplemented by our own geotope surveys, so that currently over 170 "geological special features" have been recorded. The data bank also includes settlement history and natural and landscape features as well as line data such as nature, bike and hiking trails.
At this point, the base map and the data bank can satisfy most web and printing uses.

In cooperation with the University of Applied Sciences Munich, an interactive map application for the website was developed, in which the topographical map can be continuously blended with the geological map with superimposing controls.
The online presence comprises numerous informative pages of managed content including photos and galleries, integrated 360° panoramas and videos. For several years now, the presentation has been responsive, adapting the layout to digital end-use devices and maintaining links to tourism marketing organizations.

In Germany, data from the most diverse authorities is available to geoparks for their own use to merge, process, re-work and present to different target audiences.
The information centers operated by the National Geopark Ries are equipped with info-points, that is, computer stations providing access to selected internet pages.

In addition, they are furnished with two animated portrayals, the "Geological History of the Earth" and the asteroid impact, created on behalf of the National Geopark Ries.
Independent digital special applications are now integrated in the Geopark Ries website, including links to audio tours and a Progressive Web App.
The audio tours are professionally produced in the style of a radio drama. Available at designated locations identified by signs bearing a unique QR code, the audio segments provide information in entertaining stories narrated by professionals.

The PWA (Progressive Web App) is a hybrid of website and app, with the advantages of both. Hosted by a service provider, it is maintained by the Geopark. The Geopark utilizes this application to communicate the contents of technical geological informative panels in simpler language, to read as well as to hear, both in German and in English.

GEOPARK TRAVELING EXHIBITIONS AS TOOL OF RAISING AWARENESS ON UNESCO GLOBAL GEOPARKS. THE CASE OF THE EXHIBITION: GAIA MEMORIES

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Keywords: Educational Activities, Geotourism, Geological Heritage, Natural Heritage, Sustainable Development.

The exhibition "Gaia Memories" presents the impressive geological monuments from the UNESCO Global Geoparks of Greece and Cyprus in a comprehensive and attractive way for the general public.
It was organized by the Natural History Museum of the Lesvos Petrified Forest with the contribution of the UNESCO Global Geoparks in Greece - Cyprus, the Natural History Museum of Crete, the Universities of the Aegean and Patras, the Institute of Geology and Mining Exploration (IGME) and the Geological Survey of Cyprus.
The exhibition was presented at the Eugenides Foundation, in Athens, from October 2018 to May 2019 with more than 41.000 visitors, 15.912 were students from 360 schools who participated in educational programmes. It was then presented in Nicosia Cyprus with great success, promoting Geoparks as sustainable tourism destinations.
Visitors experience the beauty of the landscapes and the processes that transformed the landscapes over time providing the background for the development of a variety of modern ecosystems. They will also discover the opportunities available to the public to engage in touristic and educational activities.
The exhibition is complemented by educational and informative activities and aims to educate and familiarize visitors of all ages with the world of nature, culture and science.
Parallel events were organized contributing to the promotion of the Geoparks in Greece and Cyprus as sustainable tourism destinations and learning places for sustainable development.
The exhibition is divided into three main sections containing impressive topics and interactive presentations. The first section presents the UNESCO Global Geoparks and the wealth of their geological treasures, the Global Geoparks Network and its networking activities. The second section presents the UNESCO Global Geoparks of Greece and Cyprus: Lesvos Island, Psiloritis, Sitia, Vikos-Aoos and Chelmos - Vouraikos Geoparks in Greece and Troodos in Cyprus unravel the history of their fascinating monuments, rock formations and fossils.
In the third section visitors discover the geotouristic activities and educational programmes organized by the UNESCO Global Geoparks of Greece and Cyprus. Highlights of the exhibition include unique fossils and an impressive petrified tree trunk from the petrified forest of Lesvos. Floor graphics, fossilized plants and animals, photographic and audiovisual displays present the history of the processes that created their spectacular landscapes and geosites.
The exhibition has been organized through the cooperation project "Geotourism Development in Insular Geoparks"/GEO-IN which is financed by E.U. INTERREG Greece-Cyprus and national funds from Greece and Cyprus.
Visitors rate the exhibition as the highest educational tool to both young children and adults as there is a wide variety of information that can be customized and stimulate interest!
It gave stimuli for reflections and wishes for future collaborations with operators and people who work in the field of Geoparks!

The exhibition gave birth to new "Geoparkers"!

DISCOVERING GRIPPING GLOBAL GEOPARKS NETWORK

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Keywords:-Geopark, Communication, Future, Networking, New Technologies

The aim of this comunication is to inform Global Geoparks Network (GGN) and UNESCO Global Geoparks the lack of awareness of the public about Geoparks.

There is a lack of awareness about Geoparks; most people do not know anything about it. They need to know more and develop their own knowledge and the best way would be through social media.

Furthermore, it is needed to develop a wide range of interactive methods so as to meet the need of future generations and attract more interest on Geoparks. To execute this plan, it should be made a database with the main datum: official name, coordinates, country or countries, number of geosites and their descriptions and so on. This concept may be useful; globalizing this data unifies all the Global Geoparks so working as a Team.

In addition, this Global Geopark database could help to bring closer different viewpoints towards a common point. It was also noticed that the global dataset might improve global communication, which is one of the GGN mission. Besides, it will make it easier to communicate better with a younger audience, with more visual tools like: GIS Data Viewers or with a bank of images. For example, in Spain there is a geosites platform created by IGME (Spanish Geological Survey), initiatives such as “Sponsor a rock”, “Geolodía (Geological Day) field trip, etc. are also available. This could help us make geology and Geoparks more attractive. These initiatives are free to use and therefore they provide a great opportunity to be active, to explore the natural world and enhance sustainable development.

To sum up, we expect GGN must create a global GIS database that could achieve the engagement of society with the Geoparks world. The goal is to use interactive social networks as a catalyst for positive social change and enhance geological heritage.

LESVOS PETRIFIED FOREST AS A PEDAGOGICAL TOOL FOR CLIMATE CHANGE EDUCATION AT LESVOS ISLAND UNESCO GLOBAL GEOPARK

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Keywords: Education, Climate Change, Petrified Forest, Lesvos Island UNESCO Global Geopark.

Lesvos Petrified Forest at the Lesvos Island UNESCO Global Geopark shows abundant evidence for past climate change as it reveals information about the composition of the palaeoflora (an important indicator of the past climatic and environmental conditions and their changes) and green house effect during the last 20 million years. At the same time Lesvos Petrified Forest is an area which provides opportunities to educate the public and especially the school children about current climate changes.

Geological monuments and geosites provide a particularly effective pedagogical tool to engage students in learning through on site exploration. Recent research that has been carried out emphasizes the importance of engaging pupils in active and authentic learning experiences. The huge amount of geological data of the past combined with today records about climate change provides invaluable opportunities to create such experiences for school children.

Preparing pupils to explore, understand and tackle current challenges such as climate change is an important task for the Lesvos Island UNESCO Global Geopark which has prepared innovative pedagogical approaches for this very purpose.

In this paper is presented the educational program “Climate change: Learning about the effects by observing the Petrified Forest of Lesvos” and the educational materials that have been designed to raise awareness on climate change. Through a variety of educational activities, pupils are encouraged to explore the causes and aspects of climate change, to think critically, formulate arguments, evaluate solutions and choices, and take action.

"CELEBRATING EARTH" EXHIBITION – A MEANS OF COMMUNICATION, EDUCATION AND TOURISM MARKETING FOR THE FAMENNE-ARDENNE UNESCO GLOBAL GEOPARK

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Keywords: communication, tourism, education, partnership.

The Famenne-Ardenne UNESCO Global Geopark is the first and only Geopark in Belgium since April 2018. The concept of Geopark is a new concept to assimilate and discover for the inhabitants of the territory of the 8 communes, but also for the all Belgian citizens. Our first challenge and objective is to consolidate this notion with these inhabitants, to invite them to take part in the project and then to promote it in and out of its territory. We choose as a means of communication a general exhibition of our Geopark Famenne-Ardenne in the heart of Brussels. It is a scientific, tourist, educational and promotional tool for our entire region, our partners and tourist attractions located in the area. It is a means of soft, responsible and collaborative marketing development around the "Geopark Famenne-Ardenne". The concept of UNESCO Global Geopark, the UNESCO values, the promotion of the EGN,... are also at the heart of this exhibition for the general public.

The exhibition "Celebrating Earth" aims to be a global project, addressing through different themes the main constituent and representative aspects of our Geopark. The geology, karstology, paleoclimatology and scientific research carried out within the territory are for the first time explained in a broad way to the general public. Archaeological excavations, underground or underwater that allowed us to build our history and illustrate the evolution of our society within the entire territory. Cultural richness, folklore and traditions are also presented to our visitors. But also our partners, accommodations, tourist attractions, local producers who are the true ambassadors of our values and the sustainable and eco-responsible actions that we want to put in place.

With "Celebrating Earth" is the opportunity for the Geopark Famenne-Ardenne to present a sustainable project at the national level. Indeed, the exhibition is initially installed in the center of the European capital, Brussels. But it wants to be itinerant and mobile, it will then be placed in different places that can accommodate it on the territory. It is a multidisciplinary and comprehensive project calling for the intervention of several scientific skills as well as the help of various external experts. In partnership with Wallonia Belgium Tourism, we have put in place a precise marketing plan, allowing strong local and national media communication: posters, flyers, radio, TV, social networks (Facebook & Instagram).

PROMOTING GEOSCIENCE EDUCATION IN SCHOOLS: THE PORTUGUESE OLYMPIADS OF GEOLOGY AND THE ROLE OF THE AZORES UGGp

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Keywords: Portuguese Olympiads of Geology, Geoscience, Education, Schools.

The *Portuguese Olympiads of Geology* (POG) are annual contests for Geology students of the 11th grade, which are organized in Portugal since 2015, by initiative of the Geological Society of Portugal (J.C. Kullberg, President), under the auspices of the International Geoscience Educational Organization, funded by the Ministry of Education and the *"Ciência Viva"* Agency, and supported by several Portuguese Universities and by the Azores UNESCO Global Geopark (UGGp). POG's main goals are to foster the interest of students on Earth Sciences, to give educational tools to high school teachers, to bring high schools closer to universities, to encourage young students to pursuit Geosciences at the university level, and to assure the Portuguese representation to the International Earth Sciences Olympiads (IESO).The POG comprise three stages of selection, which startin each high school; then a second phase occurs at a regional level (four regions), involving the previously selected students (3/school); and, finally, a third phase gathers the 25 best students found in the regional phase. The winners of the final phase represent Portugal at the IESO.

Since its very first edition, the Azores UGGp had an active role in organizing this event in the Azores Autonomous Region. It all starts by granting that all the high schools in Azores receive the information delivered annually by the National Commission for the Portuguese Olympiads (J. Relvas, National Coordinator). Then, the Azores UGGp takes full responsibility for the organization of the regional phase in the archipelago. Since it consists of nine geologically amazing islands, the Azores Geopark brings together the finalists of the scholar phase, and organizes educational and fun geoevents during a two-days program that uses the POG regional phase as a trigger, but goes far beyond this in terms of public engagement. Many associated activities give the regional phase of the POG in Azores a very significant meaning for the participants, being widely appreciated by students and teachers.

In the last editions, over 210 high schools and 3,400 students from all over the country were annually involved in the POG. Due to the engagement of the Azores UGGp, the participation of high schools and students from Azores has raised from the initial 7 schools and 41 students in 2015,up to a maximum of 12 schools and 121 students in 2018. In two successive editions - 2017 and 2018 - one of the three finalists who have represented Portugal at the IESO (in France and Thailand, respectively) were from Azores, both having returned proudly awarded with bronze medals.

Thousands of Portuguese students and teachers prove that POG is a worthwhile initiative that has widened the visibility of Earth Sciences and underpinned the social impact of Geology. After all, the conquest of international medals is an instrument and a reward, but not a goal by itself!

"TIME TRAVEL". THE USE OF BOARD GAMES FOR GEOEDUCATION

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Keywords: geoeducation, geointerpretation, gamification, geoheritage.

One of the challenges a geopark team is facing when it comes to geoeducation and geointerpretation is that most of the times the subjects are too abstract and difficult to "translate" for the general public. How can you speak about dinosaurs, when no dinosaurs can be seen? How can you make people realize that 70 million years ago this hill was an erupting volcano? Gamification comes to the aid of the geoparkers (the geopark team and partners) and offers various innovative ways of sending the message across. Games, and elements of games, are sometimes the best method to use in interpretation and education concerning geoheritage. The range of techniques varies from the simplest drawing or test, to more complex ideas. In 2018 the Hateg Country UGG and its young volunteers designed a new board game, called "Time Travel". The game is not similar to other, famous board games, but comes with a unique game mechanics, designed and tested for an extensive time. The game features not only the territory of the Geopark and the surrounding areas, but also adds Time into the picture, by having 6 relevant time periods, including the Future. The artifacts and experiences collected by the players in order to win are thus arranged also by the time when they were formed. "Time Travel" is a very useful tool for at least two reasons: 1 it makes people understand better the concept of Deep (geological) Time and 2 it shows the unique way of a Geopark to link all the assets of the territory. The presentation will focus on the importance of games for geoeducation, on the methods used by games and on the particular features of the presented game.

THE USE OF FILM & MEDIA APPRENTICESHIPS TRAINING TO TRANSFER SKILLS TO YOUNG PEOPLE IN THE ASPIRING BLACK COUNTRY GEOPARK, UK

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Keywords: Education, training, film, apprenticeships.

A new UK government training initiative known as the 45 day Apprenticeship scheme is currently being tested in the UK. This is aimed at college students who are looking to find work experience at the same time as academic education so that they are better prepared for the world of work. The Aspiring Black Country Geopark team, in partnership with one of the local training colleges set up a novel apprenticeship scheme based around the geological and cultural heritage of the proposed Geopark. The scheme engaged 4 teams of young people from media studies, film making and photography courses and challenged them to establish themselves as start-up creative businesses. They were tasked with selecting heritage projects to produce a creative interpretive product for their chosen aspects of the heritage of the proposed Geopark. The process involved intense business planning and project planning training, followed by scripting, filming, interviewing and editing work to produce new media products for the heritage of the area. The young people grew in confidence, produced excellent audio-visual materials and learned a host of new skills and practical life lessons in the project. This paper will show some of the video and visual project work they produced and discuss the benefits and challenges of hosting and developing Geopark media projects in this kind of creative partnership working.

REVEALING HYDROGEOLOGICAL HERITAGE IN NATURTEJO UNESCO GLOBAL GEOPARK (PORTUGAL)

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Keywords: communication, hydrogeological heritage, Naturtejo Geopark.

In order to respond to the current challenges facing Earth, society is forced to deal with several sustainability issues, where geosciences are crucial for a wide understanding, for example in natural resources management. UNESCO Global Geoparks (UGG), act as incubators for sustainable development and are privileged territories for public engagement. The Geoparks have a special responsibility, supporting communities to develop solutions to these sustainability issues. Naturtejo UGG has a significant hydrogeological heritage, with 10 geosites (of 175 inventoried geosites) that have specific hydrogeological interest. These sites are essential to engage visitors and local communities in the importance and vulnerability of the water resources. As a UGG, Naturtejo Geopark is committed with the 2030 Agenda for Sustainable Development, that appeal for "increasing water efficiency and improving water management" to meet the growing water demands (SDG6). The Geopark's geodiversity is reflected in several different mineral waters, coming from the circulation of groundwater in sedimentary, schist, quartzite and granite formations, at different depths and temperatures, with specific residence time in a complex interaction between water and rocks. These hydrogeological processes are responsible for unique waters, with unique stories, some of them recognized, for their therapeutic properties, since the Roman period, as mentioned by Pliny the Elder in his encyclopedia "Naturalis Historia". Lastly, all these unique waters are acclaimed by communities, in daily routines or sacred traditions. Aiming to enhance awareness to the topic, to foster the understanding of the processes, to engage people to rethink behaviors and to take better-informed decisions, Naturtejo UGG includes water resource topics in visits, exhibitions, tourism and educational programs, thermal spas, workshops, etc., linking geological heritage with cultural and intangible heritages. The "Acqua Challenge" is a strategy greatly appreciated by different audiences. It is a blind water tasting which requires the identification of water properties through the senses, looking for the unknown, geological, story of each water. The challenge is made with different types of water from the Naturtejo Geopark territory, with distinctive characteristics, compared with some of the most common waters from other parts of Portugal (from springs and bottled). This experience raises questions, not only about the water itself, but also about geology, hydrogeology, water resources management, aquifer pollution, economical activities, culture and traditions. It is necessary to overpass questions like "What are the therapeutic properties of this water?" to raise questions like "How do these waters acquire these properties?" or "How to ensure the quality of this water?", "How to harmonize needs for water by different actors such as agriculture, industry and social?" or "How can this water be protected?". The future well-being, strongly dependent on water resources, requires innovative approaches that lead to innovative sustainable solutions, starting by engaging visitors and local communities in the UGGs.

MERGING ART AND GEOHERITAGE IN SIERRAS SUBBÉTICAS UNESCO GLOBAL GEOPARK: THE GEOPAINTING PROJECT

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Keywords:(Painting, Art, Geological Heritage, Promotion, Sierras Subbéticas)

In southern Spain, Sierras Subbéticas UNESCO Global Geopark represents a paramount example of the External Subbetic Zone of the Betic Cordillera. With an impressive marine fauna dominated by ammonites, a set of rocks including evaporates, claystones, carbonates, marls and travertines, and a large diversity of karst landscapes showing distinct and unique assemblages of flora and fauna, the Geopark provides inspirational environments and atmospheres for art development.

During the last three editions of the European Geoparks Week, Sierras Subbéticas has explored this concept developing a comprehensive artistic activity entitled GeoPainting. Participants had the opportunity of using different painting techniques, including watercolor, chalk, impressions, transferences or collages, to create figurative and abstract works at different formats. The real particularity of GeoPainting is that the entire artistic process, including not only the drawing objects but most of the painting material, come from the territory. For instance, the chalks are made with Triassic varicolored clays, the Quaternary travertines are used for the impressions and the collages can incorporate all kind of Geopark materials, such as soil, sand, leafs, branches, etc. At each edition, the programed GeoPainting activity was based on different landscapes, rocks and techniques.

The aim of this activity is the promotion and dissemination of the Geological Heritage merging Geology and Art in a transversal way, i.e., painting Geology and using Geology for painting. This artistic approach, addressed to participants of all ages, escapes from the classical educational and promotion activities, as it explores the inspiration and sensation in every person in order to promote Geological Heritage at the level of feelings.


SUSTAINABLE
DEVELOPMENT
& GEOTURISM

ASBESTOS MINE: A HISTORICAL MINE THAT BECAME A MODEL FOR REHABILITATION

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Keywords: Mine, Rehabilitation, Sustainable development, Cyprus

The Asbestos Mine is located in the heart of the Troodos UNESCO Global Geopark and is spanning an area of 3,3 km^2. It has been the biggest exploited chrysotile asbestos deposit in Europe.

The fibrous texture of asbestos attracted the ancient inhabitants, who quickly discovered its natural properties (non-flammable and heat resistant), and started using it mainly for making shrouds for the cremation of the dead, shoes and wicks for lamps.

The production of asbestos in an organized manner began in 1904 at the present site with a significant economic and social contribution to the whole island. Until 1950, the ore excavation was carried out manually, and the employment of a large number of workers were necessary, many of whom lived with their families in nearby temporary buildings, which gradually evolved to a booming mining community with a church, a school, a hospital, a police station, cinema, and shops. It is also worth mentioning that asbestos fibres were transported to the Limassol port via an aerial cable car route, which it was an advanced engineering project at that time.

After 1950, the mine mechanization began with the use of heavy duty bulldozers, conveyors, crushers, screens and fiberizing mills, which led to a decrease in the number of employees. Furthermore, the international campaign against the use of asbestos caused the decrease in both its demand and price, resulting in its sudden closure and the gradual abandonment of the community of Pano Amiantos.

During its operation between 1904 to 1988, it is estimated that approximately 130 million tons of rock were excavated, producing one million tons of asbestos fibres. Its sudden closure left serious environmental problems urgently requiring mitigation measures. The consequences of its closure were: the adverse effects on the environment, the large open pit, the huge waste dumps with stability issues, the pollution of the soil/water and the barren nature of the dumps.
Following the termination of the mining lease in 1992, in 1994 the Government undertook rehabilitation works under the guidance of a multidisciplinary technical committee, aiming at the stability, rehabilitation and reforestation of the waste dumps and the mine as well as the restoration of abandoned buildings.

According to recent studies and annual airborne measurements conducted by the Cyprus Geological Survey Department, the rehabilitation works have made the broader area of the mine safe from the dispersion of airborne asbestos fibres.
Today, the Asbestos Mine area is green, hosting the seed bank of the Department of Forests, the Troodos Unesco Geopark Visitors Center, the Botanical Garden and an artificial lake with a natural trail, attracting thousands of tourists each year.

DIGITAL CARTOGRAPHY FOR BAKONY–BALATON UNESCO GLOBAL GEOPARK

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Keywords: geoparks, geotourist maps, geoheritage, sustainable tourism.

Cartography and GIS (Geographical Information System) are interdisciplinary fields of science. Both of them can be used to foster and help a large number of human activities, including geotourism. With using GIS, or simple means of graphic design, cartographic materials are regularly produced in Geoparks all around the world to communicate with visitors.

The "Geological hiking map of the surroundings of Csopak" was published in April 2018 in folded paper map form. This large-scale geological hiking map aimed to provide hikers and geotourists with relevant geological information along with essential topographic and tourist content. It depicts the eastern part of Bakony–Balaton UNESCO Global Geopark and presents the most exciting geosites of the area.

This paper map was a success because guides and tourists can access knowledge about the geoheritage of the area from one source. However, the role of traditional paper maps decreases, since many tourists use mobile devices to navigate on the field and to search for different services. To reflect on this tendency and to broaden the digital inventory of the Geopark, an online geotourist map and a mobile application were developed. The aim was to provide information about the geoheritage and tourism features of the Geopark.

The online map was optimized for larger screens. It depicts a simplified, 100k-scale geological layer, tourist routes and the remarkable geosites over the grayscale topographic background. It is designed as a tool for planning routes and searching for places of interest or services. The mobile application is developed for Android, and it is the first Geopark- and geotourism-thematized Android app of Hungary. It includes the mobile version of the online map to help in field navigation, essential information about the Geopark and geoheritage, an event calendar and short descriptions of remarkable geosites.

These digital platforms are designed to support data collection for scientific purposes. Through the user interfaces, tourists can be asked about their opinion on the infrastructural state of certain geosites and the provided services. The collected data can be used by the Geopark to manage and promote geoheritage more appropriately. We believe that these solutions are going to help us making local geotourism more sustainable soon.

GEOPARK AS A LINK AMONG CONSERVATION, EDUCATION, TOURISM AND SOCIETY

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Keywords: geoconservation, geo-tourism, geo-education, Taiwan Geoparks, society participation.

Geoparks aim to conserve landscapes not only by preventing landscapes with the environment and scientific values from intentional or unintentional damage but by making these educationally and academically valuable sites the cornerstone for the sustainability of human society.

Geopark provides a platform and opportunity for sustainable development, especially at some sites with outstanding nature beauty. Through landscape conservation, environmental education, geo-tourism and local involvement, the awareness of the local society needs the geomorphological and environmental understanding and find a way to protect their landscape.

This study is trying to use Taiwan as a typical example to demonstrate such a link. As Taiwan is a hazardous country because of tectonic movements and typhoons, it is a challenge to cope with the natural processes for sustainable development. Among the works for Geopark, it is important to raise awareness for local society and to understand the value of geo-diversity and appreciate the beautiful landscape caused by the natural processes.

This paper demonstrates the progress of the geopark movements in Taiwan, especially on conservation, education and promoting the geo-tourism from the local society.

IS IT POSSIBLE TO LIVE OFF OF THE GEOLOGICAL TOURISM? THE EXPERIENCE OF GEANDALUS, A SPIN-OFF OF GRANADA UNIVERSITY

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Keywords: Geotourism, education, outreach, spin-off.

In October 2014, the geological tourism company *Geándalus* was founded as a spin-off of Granada University. It results from the interest shown by the general public which participated in *Geolodía*, an outreach activity of field geology coordinated at a national level by the Geological Society of Spain. One of the pillars of *Geándalus* is to make public the geodiversity of Andalucía and to make aware the population about the importance and need to protect our geological heritage. Another one is to make geology outreach in order to become aware of its utility as science at the service of society. As a company, *Geándalus* pretends to offer a job opportunity to our ex-students, as scientific guides specialized in geology and to open a new line within the scientific tourism.

The founding partners of the company belong either to the Granada University or the Spanish Geological Service or are self-employed workers. The selection of the type of the company, a Limited Liability Company spin-off of Granada University was based on the fact that we wanted that *Geándalus* had a link with the University, which represents a seal of quality.

We base our activity as a company in the use of our knowledge: we try to capitalise the scientific research by traducing it in economic value. *Geándalus* offer two types of products: a) formation activities addressed to teachers, educational centres, and professional related with the environment or other groups who demand it, and b) geological tourism, centred in routes guided by geologists; these routes are made in places selected for their geological and educational interests.

The first of the main values of *Geándalus* is the commitment with the customer to offer an excellent product and a continuous renovation of our activities. The second one is to promote the scientific (geological) culture among youth, general public, teachers and professional related with environment. Finally, the third main value is the responsibility we acquired with the society to make known our geological heritage, to appreciate and protect it as another type of heritage.

With this setting, we want to present the progress of *Geándalus,* not only in terms of results but also in difficulties.

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ART AND FESTIVALS IN UNESCO GLOBAL GEOPARKS

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Keywords: Local heritage, Art, UGGp's, Cooperation.

Magma UGGp was one of the partners in the Landart Festival event organised by Geopark Ralsko in Czech Republic from 25-27 May 2019. This exchange was possible due to the EEA Grant Fund which provides full funding for cooperation between Iceland, Norway and Spain, Portugal, Greece, Hungary, Slovenia, Poland, Cyprus etc. (http://www.eeagrants.org).

Magma UGGp and the professional artists Maiken Stene and Hans Edward Hammonds from Magma UGGp, as well as Gudmundur Arngrimsson from the Katla UGGp, participated in the Festival with oral presentations, permanent art installations and architectural landscape structures. Since 2016 the Ralsko Landart -Festival has aimed to reconnect local people with their own territory, using art as a means to reconcile the history of the violent military occupation of the area that lead to the significant destruction of several villages during the 1960s. The participation of local people was amazing: the atmosphere was addictive and exciting. This has been an additional source of inspiration to increase an artistic approach to the intangible heritage sites found within Magma UGGp.

Magma UGGp and local artists plan to strengthen the cooperation with The Velferden Centre of Contemporary Art (www.velferdenscene.com) which is an ongoing and successful international art space run within the Magma Geopark territory. Velferden hosts seasonal projects where artists from different countries are invited to come to the area for a residency period where they share ideas and create site specific works of art in the post- industrial mining landscape of Sandbekk. The connection with the local cultural and geological heritage creates a meaningful and fruitful source of inspiration for the artists and the local population. This activity also brings an audience from more regional areas and increases the focus and awareness of the local characteristics of the Geopark.

We plan to organize more art projects based directly on the Geopark' s values and educational goals. We seek to promote the connection between local Geopark inhabitants and the Moon landscape and to increase the awareness of the mining traditions and history of the Geopark through meaningful experiences of art. We would like to establish an International Geopark Art Festival in Magma Geopark and bring international artists to strengthen the focus on our unique local heritage.

The final ambitious idea is to create an open-air "Moon Art Landscape Park" by the end of 2021 in Magma UGGp.

"ATLANTIC-GEOPARKS": AN INTERREG ATLANTIC AREA PROJECT FOR THE GEOTOURISM PROMOTION AND DEVELOPMENT

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Keywords: "Atlantic Geoparks", European Atlantic Geotourism Route, Geotourism, Sustainable Development, INTERREG Atlantic Area.

The "Atlantic-Geoparks" Project funded by EU INTERREG Atlantic Area consists of a partnership, led by the University of Trás-os-Montes and Alto Douro (Portugal). Involves nine European UNESCO Global Geoparks (Arouca, Azores, Basque Coast, Burren & Cliffs of Moher, Copper Coast, Fforest Fawr, Lanzarote, Marble Arch Caves and North Pennines AONB), two aspiring Geoparks (Commonwealth of Sustainable Municipalities of Cantabria and Regional Natural Park of Armorique), and one supporter partner (GGN Association).

This project aims to promote and disseminate the geological and cultural heritage of the Atlantic Area territories involved, in order to attract visitors and generate new economic activities and incomes. To achieve these goals, there are under development seven working packages which intends to have a significant impact on the visibility of the UNESCO Global Geoparks (UGGps) designation and a noteworthy increase in the number of visitors to these territories.

The seven working packages (WP1 – Project Management; WP2 – Communication; WP3 – Capitalization; WP4 – Geosite Management; WP5 – Transnational Marketing; WP6 – ICT Tools for Discovery, Understanding and Enjoyment; and WP7 – Training and Capacity Building) are already in an advanced stage of implementation. During 2020 these tools will be implemented and shared with the remaining GGN members. A special emphasis will be given to the implementation of the new ICT tools, and to the training and capacity building courses. In the final phase of the project is aimed to build-up the "European Atlantic Geotourism Route", which intends to develop and promote a new cultural route that celebrates Geotourism and UGGps as unique destinations to visit and enjoy. The "European Atlantic Geotourism Route" winds an intriguing transnational path from Ireland and the UK, to France, Spain and Portugal, over to the Atlantic Islands of Azores and down to Lanzarote in Canary Islands. It links 12 dramatic landscapes that host vibrant communities, rich local cultures and unforgettable visitor experiences.

CITIZEN SCIENCE AND SUSTAINABLE DEVELOPMENT IN THE ESTRELA ASPIRING GEOPARK (PORTUGAL) STRATEGY

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Keywords: Sustainable Development, Agenda 2030, SDGs, Citizen Science.

The UNESCO Global Geoparks (UGGps) are territories of science, education and culture. These develop holistic approaches to sustainable development aiming to create new tools that can reinforce endogenous values and empower local communities. The Estrela Aspiring Geopark was created and implemented based on this reality and principles. Since the beginning, sustainable development of the territory was a priority, considering the uniqueness of the Estrela Mountain area and the importance of the protection and valorisation of its endogenous potential, with emphasis on the geological heritage. This approach corroborates a concern for sustainability and the Sustainable Development Goals (SDGs) of the Agenda 2030. In this context, the Estrela Aspiring Geopark is already dedicating each year to a specific SDG, through a plan of action in the areas of citizen science and education. This strategy aims to raise awareness, to promote and to define strategies to achieve the SDGs, adapting them to the reality of this territory. This project is based in an action plan programmed for the next 10 years. Especial attention will be given to SDG 13 “Climate Action”, which will be the theme of the year for 2020. This will include multiple actions involving local communities and scientists, in order to alert for or to solve concrete problems in this territory, related with specific geographic constrains. In fact, the UGGps, in pursuit of the aims of the International Geoscience and Geoparks Programme (IGGP) are territories whose development strategy must be leveraged by the SDGs of the Agenda 2030. The reality of each of the 147 UGGps and the multiple aspirant territories to this UNESCO designation must find on the SDGs the base for the development of their master plans in order to achieve an effective sustainable development. However, bearing in mind that all this work is based in a strong networking at a national and international level, we must consider that SDG 17 "Partnerships for the Goals” is a tool to connect all the SDGs. In this context, the Estrela Aspiring Geopark has established a network of partnerships with different stakeholders in the territory, as well as with the Global Geoparks Networks (GGN) and the European Geoparks Network (EGN). In Portugal, we highlight the partnership with the Portuguese Forum of UGGps and with the UNESCO Chair on “Geoparks, Regional Sustainable Development and Healthy Lifestyles”. This reality has allowed the management structure of the Estrela Aspiring Geopark to develop a set of partnerships and initiatives allowing a strong cooperation between the Portuguese UGGps and other Aspiring Geoparks, functioning as a platform of good practices, in order to contribute for a regional sustainable development.

"GÉODELICES PROJECT", ROCKS TO EAT FROM THE CAUSSES DU QUERCY GEOPARK (FRANCE)!

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Keywords: geoproducts; local development; Brand; local mobilization.

Inspired by the experience of others Geoparks, the Causses du Quercy Geopark is looking for new ways to talk about geology to its visitors and inhabitants. And what better way to talk to the public than through food? The Geopark has therefore decided to propose to its bakers and chocolate makers to develop a new line of chocolates and pastries: the Causses du Quercy's "GéoDélices".

Bakers and chocolate makers are local stakeholders with whom the Geopark has never worked before and has consequently very little contact with. Thus, this project was an interesting two-year experiment on the mobilization of a new public by the Geopark and the development of new resources...

The Geopark asked for the assistance of the local Crafts and Artisans Chamber, one of its very strong and longstanding partners, and obtained financial support from its institutional partners (Occitanie Region and Lot Department). The decision was taken to run the project in two phases:

- The first step was a contest to mobilize local bakers and chocolate makers, to stimulate their creativity, to help them to make local geology their own, and also to create a fun moment to share the project with the local public.
- The second more formal phase was to shift from prototypes to the commercial phase itself by the manufacturing of moulds for the production of chocolates, the recipe adjustments, the design of marketing tools and the organization of an official launch.

The project is very successful: seven GéoDélices are now produced by the four craftmen and are for sale (only in their own shops for now); the public was very receptive and the project was strongly followed by the local media. The Geopark is currently trying to help them to find other selling points linked to tourist sites or other touristic partners and to extend the project to restaurants.

However, it is fundamentally different to support a local initiative, to simply encourage them or, like here, to build a project ex nihilo. Some lessons can be drawn from this experience of mobilizing a public not already fully involved in the Geopark and shortcomings in the approach should be avoided for future projects. For example, the lack of in-depth understanding of the pastry or chocolate makers professions has led to certain gaps (e.g. the representation and cultural value of a contest in this kind of profession) which have had impacts on the conduct of the project.

GEOHERITAGES AND SUSTAINABLE DEVELOPMENT: A CASE STUDY OF LICHI BADLAND GEOPARK, TAIWAN

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Keywords: Geoheritage, Sustainable Development, Lichi Badland Geopark, Taiwan.

Lichi Badland Geopark is located in the southeastern part of Taiwan. Geologically, the geopark is consisting of the Lichi Mélange formed by the subduction and collision between the Eurasian Plate and the Philippine Sea Plate from about 5 Ma until now. The Lichi Mélange is mainly composed of mudstone, mixed with exotic blocks of various types and sizes. The exotic blocks include sedimentary rocks such as sandstone, shale, interbedded sandstone and shale and other remnants of oceanic crust for instance basalt, gabbro, and columnar basalt. Badland topography and various types of exotic rocks are the most important and outstanding geological phenomena in this geopark. Understanding the geological features and the value of the whole geoheritage can not only give local people a sense of pride and identification with their region, but also serve as a base to develop environmental education, geo-tourism, geo-products and further promoting the local economy and achieving sustainable development. The community residents of Lichi Badland Geopark are mainly engaged in farming, and they are not educated in and on earth sciences. They have limited understanding of their own geoheritages. In order to achieve the goals mentioned above, however, a lot of related work has been done since the initiate of the Lichi Badland Geopark in 2010. Those completed and ongoing works include: (1) Geosite inventory: Through interviews with community cadres and the public, surveys and inventory of resources have been conducted with the community to understand the geology, landscape, human history, ecology, and agricultural specialties that they own, as applicable resources for the geopark; (2) Capacity building: Geological experts obtain information through literature collection and on-the-spot investigations, and then translate scientific data into popular materials that the public can understand. Through continuous and hierarchical training including the seed narrator training, environmental education for students of primary and high school, etc., to learn about the land where you live, and to introduce the story of their hometown; (3) Networking activities: In order to continuously improve the ability of community residents to promote the geopark, to share the experience promoted by domestic and foreign geoparks. Networking activities involve the organization of conferences, workshops, training courses, field studies, production and presentation of local geo-products, among others. (4) Development and production of promotional material: To promote the geopark, increase the elements and characteristics of the territory, scholars and community residents jointly carry out the LOGO design of the Lichi Geopark, and make folding, postcards, bags, books, brochures, among others. There are many prospects for the future, including improving sustainable development plans, continuing to build capacity for local communities, seeking support from local governments, providing guided tours and developing geo-products, etc.

ASPIRING SAIMAA GEOPARK – THE COMMITMENT TO SUSTAINABLE TOURISM

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Keywords: Aspiring Geoparks, Sustainable development and Geotourism.

Aspiring Saimaa Geopark is situated in two regions, South Savo and South Karelia, in Eastern Finland. This area is a part of Finnish Lake District. It is also the most popular summer holiday area in Finland. In the area of Saimaa Geopark there are a lot of summer cottages and countryside lodging. The area is also specialized in nature tourism.

Regional Council of South Savo has made a commitment that will help to develop lake Saimaa area as an example of sustainable tourism destination. Saimaa Geopark and the tourism organizations of the Saimaa area have also joined to the commitment. The idea is that in tourism industry you act in a responsible way and take account the sustainable development in every action.

The carbon footprint of the tourism has been calculated in South Savo region. The regional council is going to follow up the development of the carbon footprint. The general principals of the responsible tourism have also been made together with the Association of the Saimaa Geopark. The regional council is committed to advance the sustainable tourism in its own work too e.g. when financing projects or planning land use. The regional council of South Savo was the first in Finland that began to grant D.O labels. The label is called Designation of Origin Saimaa. Designation of Origin Saimaa is Finland´s first proprietary label. Aspiring Saimaa Geopark is developing its geofood brand to be implemented by D.O. Saimaa. Saimaa Geopark project and the D.O. Saimaa brand owners have an important role to grow and develop the nature tourism concept in Lake Saimaa region.

Society's Commitment to Sustainable Development is a key instrument for implementing the UN 2030 Agenda for Sustainable Development in Finland. Society's Commitment to Sustainable Development is a shared long-term vision of the Finland we want to have in the future. By making operational commitments, the actors commit themselves doing their part in attaining the objectives set. The operational commitments include concrete measures, changes in operating procedures and innovative trials that promote the shared goals. Through these concrete commitments, operators can take part in the promotion of all or just some of the shared objectives. By making a commitment, the operators also participate in the national implementation of the global agenda for sustainable development, Agenda2030.

The Finnish National Commission on Sustainable Development and its general secretariat are responsible for establishing the commitments. All the commitments are made available to the public in the online service www.sitoumus2050.fi. You can find the commitment of South Savo Regional Council also in English from that webpage.

QUANTITATIVE METHOD FOR THE ASSESMENT OF THE SPANISH GEOPARKS AS A WHOLE

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Keywords: networking, forum, quantitative assessment, strategy.

Geoparks have become one of the most successful initiatives for the local development of many territories worldwide. The holistic approach of the development strategy and its capacity to adapt to different realities is without any doubt one of the main feature that makes this program so attractive. Local development in geoparks is achieved through different areas of work like scientific research, education, geotourism, geoconservation and development of local products.

Geoparks create concrete results individually, thus, this brand is becoming more and more popular in many countries like Spain, Italy, Japan, China or U.K among many others. This is the reason why Spanish Geopark forum decided to develop a simple questionnaire in order to show what geoparks represent quantitatively at the national level in different areas of work. We need to show not only who we are, but also how big we are and which is our potential as a whole. This approach is now more necessary than ever, as we are a UNESCO designated program with national committees that should support national policies for the development of geoparks.

Spanish geoparks have worked for two years to get a first quantitative assessment. First we opened a discussion to define 42 key questions that give the main picture of what we are. As a consequence of this work Spanish geoparks have developed a very useful table that gives us the possibility to compare data among us in different areas of work and to be aware about our real "size" and potential as a whole. This table must be updated every two years.

Among many other data now we know that for instance more than 500.000 people live in about 200 municipalities inside Spanish geoparks. We are key territories for the management of the geological heritage as there are more than 500 Geosites, of which about 70 are of international significance. We can play an important role in nature conservation, as there are 80 Natural protected areas. We contribute significantly to natural sciences as more 150 scientists belong to our scientific committees and geoparks produce about 100 scientific publications every year. We can be very important territories for education, as Spanish geoparks contain about 250 schools with more than 40.000 students per year and our educational activities reach to more than 80.000 schoolchildren every year. Our territories receive every year more than 10.000.000 visitors, so geoparks have a great potential to develop a more sustainable and responsible tourism.

UNESCO GEOPARK VIS ARCHIPELAGO (CENTRAL ADRIATIC SEA CROATIA): TOURISM AND HERITAGE FOR THE FUTURE

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Keywords: Geopark Vis Archipelago, Sustainability, Blue Cave.

The Geopark Vis Archipelago project developed out of the ever-growing awareness of the global valorization importance of this unique insular area in the Adriatic Sea, with exceptionally rich and well-preserved natural and cultural heritage. This is the Vis island archipelago, which comprises a number of open-sea islets in a marine zone embracing 6,661 km². The rich natural and cultural heritage has not been recognized on a global level. For this reason we initiated the project of global valorization of this unique Adriatic heritageNumerous activities were undertaken in order to familiarize the locals with the Geopark – a Visitor Center in Komiža was established, geotrails were instaled and many educational events, workshops and partnerships took place. On the island of Biševo, where the The Blue Cave, Geopark's world renowned attraction, — is located, an old deserted elementary school building will be renovated and remodelled into a brand new "Blue Cave – Biševo Visitor Center". One of the aims of the Center is the foundation of an international Nisology study program which would serve as a generator of new projects and the exchange of know-how between scientists, experts and students through interuniversity international cooperation. The inclusion of the island of Vis in the UNESCO Global Geoparks Network happened at a moment in which the mass tourism model will most probably be forced upon the eastern Adriatic coast and the island of Vis. Chaotic development is a more probable outcome, and this means that the island is overrun by tourists for a part of the year. For the rest the year island becomes deserted. On this island, which is desolate for almost half a year, young people cannot plan their futures, and the natural and cultural heritage will cease to exist, as it cannot exist without its heirs. The vision of the Vis Archipelago Geopark is based on our conviction that we are facing a historic opportunity to establish, through the global valorization of a geological, natural and cultural heritage, a developmental model that will end the island's demographic decline, restore its vitality and sustainable development, and give the younger generations hope for the future of this island, which has the oldest geological history on the Adriatic. The island was once the center of urban civilization, city-state governance, literacy and literature along the eastern Adriatic coast, and the World Wildlife Fund declared this island one of the ten last paradise oases in the Mediterranean.

TRADITIONAL GEOFOOD – KARJALANPIIRAKKA - KARELIAN PIE IS BORN IN ASPIRING SAIMAA GEOPARK`S AREA

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Keywords: Geofood, Geotourism, aspiring Saimaa Geopark, traditional food, Karelian pie.

In aspiring Saimaa Geopark areas food traditions go back thousands of years before. The first signs of barley cultivation in Finland date back to 4200 BC. Buckwheat (*Fagopyrun esculentum*) was cultivated even a thousand years earlier. Fist humans came to area around 10000 – 11000 years ago during the old Stone Age. They inhabited Saimaa Geopark's natural and cultural Kuurmanpohja – Saarenoja`s area. The Buckwheats origin is in the Himalayas, China or Tibet. The plant spread to Central Europe only in the 13th century with the Tatar invasions. So the results show that the stone-age cultivation skill has arrived in Finland from a different direction than Central Europe, where agriculture spread from the Middle East.

For centuries eastern influence has affected Finland's food tradition. Stuffed pie-type pastries are known from Finland to China. In Karelian area pies developed from stuffed pie to an open and oval model pie. From the 16th to the 17th century, the current Karelian pie occured in the present Eastern Finland region, where it has spread, among other things, with the Karelian people all over Finland and elsewhere. The first written information about Karelian pie dates back to 1686. Aspiring Saimaa Geopark`s area is in the heart of Karelian pies birthplace. Karelian pie is a traditional Finnish pastry with rice porridge, barley sauce, potato mash or vegetables inside a thin non-acidified syringe.

An open, oval model Karelian pie has been registered as a genuine traditional product of the European Union in 2003 with the designation of a traditional product. The protection only applies to the name 'Karelian pie'. For example, if the pie does not meet the above requirements, the name "rice pie" can be used, for example. Or if porridge is made from lactose-free milk, it cannot be called as Karelian pie.

Karelian pie is known all over the Finland and everyone knows and eats it. It is a marvelous example for geotourism and geofood. Devoted Finns cherish local product and its originial story by etaring it in every family gatherings and even in gas starion cafeterias.

Karelian pastry baking competitions also occur, nationwide races and provincial races are held annually, usually in connection with various summer events. So you can even compete with geofood Karelian pie.

NEW SUSTAINABLE DEVELOPMENT PROJECTS IN THE CROSSBORDER KARAVANKE/KARAWANKEN UNESCO GLOBAL GEOPARK - NAKULT, NATUREGAME AND RURITAGE

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Keywords: Geopark Karavanke/Karawanken, Sustainable development, Geotourism, INTERREG, HORIZON2020.

Main objectives of the Karavanke/Karawanken UNESCO Global Geopark are conservation of geological and natural resources, and the cultural and natural heritage in the territory of its members - 14 municipalities, fostering of awareness, information and education about and in the Geopark Karavanke/Karawanken, the European and Global Geoparks Network and its positioning as a Geopark, the economic valorization of the Geopark, including through sustainable tourism and general cross-border cooperation and development of the region in terms of sustainable regional policy. Latest international projects focused on sustainable development of the Geopark area are so-called NaKult, NatureGame and Ruritage, all started in 2018. NaKult and Ruritage are both INTERREG SI-AT projects, co-financed by the European Union, through the European Regional Development Fund, and Land Kärnten, while Ruritage project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776465.

The NaKult project involves developing and equipping a long-distance geotrail which aims to valorize and enhance awareness of the Geopark's rich geo- and biodiversity. The individual stages will be analyzed and staged separately according to local focus points and combined as a whole product. Trained guides are required for engaging visitors with the geodiversity as well as the other cultural and natural peculiarities of the path. Geopark guides were already trained through European Association for Heritage Interpretation where participants mainly practice how to put strong ideas into words to engage visitors in a meaningful and memorable way.

The NatureGame project aims to strengthen the nature awareness through a combination of attractive outdoor activities and nature- and geo-experiences. The provision of adventurous activities to encourage the experience of geodiversity and the environment in playful way will emphasize the importance of the Geopark Karavanke/Karawanken. In the frame of the project a bilateral network of tourist attractions will be established, which will lead to an increase in tourists arrivals and overnight stays.

Main objective of the Ruritage project is to strengthen the sustainable development of rural areas through their unique cultural and natural heritage. Project has identified 6 Systemic Innovation Areas (SIA) which have the potential for economic, social and environmental development of rural areas. The knowledge built in 13 Role Models and will be upgraded within the project, will be transferred to 6 Replicators across Europe. Geopark Karavanke/Karawanken has been chosen to be the replicator in the SIA Pilgrimage thanks to its well-known thousands of years old pilgrimage site St. Hema Mountain in Globasnitz. In the frame of the project it will replicate good practices from Mária Út and Camino de Santiago.

GEOFOOD AND THE RURITAGE PROJECT

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Keywords: Sustainable development, local food, local communities.

The GEOfood brand developed from 2015 by Magma UNESCO Global Geopark (Magma UGG) received support by the European H2020 RURITAGE project (Heritage for Rural Regeneration) led by the University of Bologna (www.ruritage.eu) an International project with a total budget of 10 Million Euro.

The goal of the RURITAGE project is to support the development of rural areas within innovative strategy based on the exchange of key good practices around the World.

The GEOfood (www.geofood.no) idea aims to connect together local products, traditions, intangible heritage and UNESCO Global Geoparks within a common storytelling which explains the strong interrelation between the geological processes and the quality of local food. GEOfood is a brand for products and producers which aim to valorize the quality of their products in connection with the local UNESCO Global Geopark´s geological and cultural heritage. Magma UGG is developing a strong network of local producers and restaurants who are establishing commercial relation with the Geopark. Locally, Magma UGG, through the RURITAGE project, is offering mentoring for building the GEOfood marketing and commercial strategy, promotional material, possibility for expanding the business within tailored tourist GEOfood offers and promotional activities within the Magma Interactive Application (APP), the social media and the Geopark webpage. Local GEOfood partners have the possibility to get together in common events, exchanging ideas, meeting stakeholders and investors, exchanging good practices and to get support for increasing the visibility of the products into the market.

At the same time, MAGMA UGG is working to strengthen the GEOfood brand internationally, including more UNESCO Global Geoparks who would like to have the free use of the brand, criteria and promotional page. At the moment seven UGG are using the brand. MAGMA UGG welcome all UNESCO Global Geoparks to request the criteria and the brand in order to support together the rural areas and the local communities, supporting the use of local products, reducing inequality, the food waste and also the CO_2 emissions.

ECOLOGICAL, CULTURAL AND GEOLOGICAL ITINERARY TO LA VILLUERCA

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Keywords: Itinerary, Villuercas-Ibores-Jara, ecotourism, geotourism, Extremadura, Spain.

Guadalupe, the main village of Villuercas-Ibores-Jara UNESCO Global Geopark, is situated on the South slopes of the Villuercas' mountain massif. Guadalupe is a historical site due to the pilgrimage to its Monastery, today WHS, and the relationships with the Spanish royalty since its foundation. The village's surroundings are constituted by dense forest of oaks and chestnut trees, recognized as Natura 2000 area, and by mountains, among them La Villuerca is the highest one. On its top, some buildings and antennae remember the long military occupancy as a strategic point for the air force communications. Today all this headquarters are abandoned excepting one of them in which remote controlled robotized devices take the tasks that the military people did in the past. A narrow road of 11 km long that reach to the ruined military headquarters was also abandoned and consequently also ruined and unsafe. The last kilometer is noteworthy, the best panoramic view to the Appalachian relief, one of the geopark highlights.

After some years of negotiation, the Spanish Ministry of Defense and the Council of the Province of Cáceres signed in 2018 an agreement for transferring the road to the Province for the geopark use, mainly geotourism and research purposes. Furthermore, the Council of the Province of Cáceres assigned one million euros for the road rebuilding. The works have been done in 2019. In parallel, and taking advantage of the road building machinery, some research was done for the characterization of a fossil deposit of Ediacaran *Vendotaenia* and some strata of the Early Cambrian, a period that appear in few locations on the geopark due to the Cadomian emersion of this terrane.

The itinerary has different stop points for interpretation:

- A little shrine (mudejar style) as first viewpoint to the Monastery for the pilgrims that came by the Royal Road to Guadalupe.
- A hydraulic work, seven centuries age, which collect water in the Villuerca's slopes and conduct them to Guadalupe.
- The forest and the altitudinal zonation of the local flora.
- The *Vendotaenia* deposit.
- The Cambrian site.
- A snowwell built some centuries ago for the Monastery needs.
- The Viejas syncline.
- The block slope as a birthplace of the Almonte river.
- The panoramic view of the Appalachian relief.
- The panoramic view of the Guadiana river depression.

The diversity of eco-geo-cultural assets make this itinerary up a complete offer for visitors. The geopark expects that this special proposal became one of the best sites for ecotourism in the region of Extremadura.

GEOTOURISM AND GEOCACHING IN LAS LORAS UNESCO GLOBAL GEOPARK (BURGOS AND PALENCIA, SPAIN)

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Keywords: Geotourism, geocaching, sustainable.

A free Geocaching App with GPS technology was used last year in order to launch a geotourism experience within Las Loras Geopark. The activity consisted of twelve geo-referenced "treasures"-geocaches which had been previously hidden in twelve geosites and which contained information about the main geological, biological and cultural features of these sites. These treasures could be localised and visited in a funny way and the users could find information about the several sites of geological interest. As an extra motivation, the first person to find the cache would receive a package of local products.

Visitors can be tracked through this application and we therefore know that these treasures were found by more than 200 users, many of which were family members or groups of friends.

This activity was so successful that many other treasures have been hidden within the Geopark all through the year. A "Geopassport" has been prepared so that visitors can visit more than 50 sites of interest and get information about them using this treasure hunting game. Moreover, during summer 2019 a new challenge with prizes for family groups with members of at least two different generations will be launched, bringing natural and cultural heritage closer to young people. Ten out of the 50 geosites will be presented every week and the very first family group to find them will be rewarded with special prizes related to local products. We rely on the collaboration of the media in both provinces (Burgos and Palencia) to publish the new coordinates, including a photo of the previous week winners along with a review about that site of interest each Friday.

Geopassports are freely handed out at tourism offices in Palencia and Burgos, as well as in those within the towns of the Geopark and at centres and spaces associated to it, such as Cueva de los Franceses Cave, the Oil Museum, and so on.

The mobile application is very easy to use, nevertheless several workshops were carried out during the European Geoparks Week, as to give information about the use of the application and the Geopassport itself. Furthermore, at the beginning of summer training workshops will be held for those people in charge of handing out the Geopassports in each of the centres previously mentioned.

GEORAFTING – EXPERIENCING GEOLOGY

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Keywords: Rafting, Geology, Awareness rising

The Nature and Geopark Styrian Eisenwurzen has an outstanding landscape as well as Geology and one of the last unspoilt white-water rivers in Middle Europe. White-water rafting is a very common and popular sport in the area. Many tourists come especially for practicing this activity – not only from Austria, but also from neighboring countries. Even some rafting World and European championships take place each year. During the ongoing Interreg Danube GeoTour Project the Geopark has the possibility to develop a new GeoProduct and to combine an adventure sport with education. The Geopark can now of Geopark information to visitors like landscape, culture, nature and Geodiversity during a raft tour.

This Interreg Danube GeoTour project (funded within the Interreg Danube Programme) faces a challenge recognized by all partners: the sustainable use of the exceptional wealth of Geopark natural resources and heritage through sustainable tourism development that avoids the negative environmental impacts. The main project result will be joint Danube GeoTour designed to strengthen cooperation between the Geopark regions and act as an innovative tourism product to increase visibility and tourist visits in the geoparks. Common strategy for sustainable management of tourism pressures will form the basis for creating innovative geoproducts. Sharing experiences, testing pilot geotourism products and new interpretative approaches should increase local inhabitants' engagement, Geopark management capacities and lower the quality gap between Danube and other European Geoparks.

The so called GeoRafting is one part of the Danube GeoTour. This innovative GeoProduct is going to be tested and evaluated until the end of 2019. Workshops and training materials for raft guides have been created. Marketing tools have been established as well – flyers or an image video for example. The Nature and Geopark Styrian Eisenwurzen is going to show the ongoing progress on the development of this innovative GeoProduct.

NEW TOOLS FOR PROMOTING THE DIVERSE VOLCANIC HERITAGE OF BAKONY–BALATON UNESCO GLOBAL GEOPARK, HUNGARY

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Keywords: geotourism, geointerpretation, guided geotours, volcanic heritage.

Bakony–Balaton UNESCO Global Geopark has an outstanding geodiversity (172 rock formations) but its most iconic landscapes were undoubtedly formed by volcanism. During the last phase of the Alpine orogeny basaltic magma rose up to the surface and one of the densest volcanic fields was formed in Europe: approximately 50 volcanoes erupted in the Bakony–Balaton Uplands Volcanic Field. The initial phase of the intense basaltic volcanism provided a small amount of pyroclastics and lava during the late Miocene: phreatomagmatic explosions started approximately 8 million years ago in the the present Tihany Peninsula. Subsequently, the predominant part of the volcanoes were characterised by a calmer activity producing lava fountains and cinder cones, nevertheless, the activity that produced lava flows was the most common one. Phreatomagmatic explosive volcanic activity started later again in the Tapolca Basin and Káli Basin over the Pliocene erosional surface but in other places extensive lava fields were developed. Due to frost disintegration during the Pleistocene, mainly slope debris accumulated on retrograding hillsides in the dry and cold periods. During interglacial periods watercourses, fed by the abundant rainfall, carried a significant amount of loose sediments away. This erosional process led to the formation of the basalt-capped volcanic remnant hills, landmarks of the Geopark.

Balaton Uplands National Park Directorate, the management organization of the Geopark, operates 14 visitor centres and interpretive sites (mostly by contracted local entrepreneurs): some of these facilities are connected to the diverse volcanic heritage. Hegyestű, with its famous columnar jointed basalt, is one of the most important geological interpretive sites in the Geopark where, thanks to the Interreg Danube GeoTour Project, a new volcanological exhibition to attract visitors with a set of scientific-based interactive attractions and visual take-home experiences will open in the near future.

The volcanic landscapes are popular destinations for our visitors: there are also many guided geotours along these geosites. The picturesque Káli Basin is an ideal place to learn about the volcanic, natural and intangible heritage. The new, 28-km-long 'Route of Fire' Nature Trail, between Hegyestű and Kopasz Hill, reveals various events in the history of the area, and an accompanying booklet provides a glimpse into the volcanic heritage of the Danube region as well.

Probably Badacsony is the best known volcanic hill in Hungary, also famous for its wines, where the old nature trail was redesigned (its new name is 'Ring of Fire'). The 'Basalt Organs' Nature Trail, with its emblematic geomorphosites, also attracts many hikers on the remarkable Szent György Hill.

The displays of the mentioned exhibition, the easily understandable text and figures of the interpretive panels and the booklet, written by Szabolcs Harangi geologist-volcanologist, are also in English because our Geopark welcomes many visitors from abroad as well.

THE NEW TRAVELERS' GUIDE OF THE CATALUNYA CENTRAL UGGP

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Keywords: Geotourism, Guide, Storytelling, Heritage.

The Catalunya Central UGGp presented in February 2019 a new travellers' guide. It is the most important project carried out by the Geopark to attract visitors to the territory since it became a member of the Network in 2012.

The guide was edited by the very well-known French publisher Petit Futé, which has an ample echo in the French-speaking countries, where is a leader touristic media. It creates great influential touristic content in French around the world.

This guide will help the Geopark to position itself as an attractive and sustainable destination to one of the main international source markets for the Catalunya Central as it is France. The aim of the guide is doing it by taking advantage of the projection and prestige of the brand UNESCO on the one hand, and the powerful geological story of the inner sea that once covered the territory -and finally disappeared- on the other hand.

The basic structure of the guide follows the template that characterises this publisher. However, we have customised it a little bit by including the main distinctive geotouristic elements in a way that they are connected with the storytelling of the geological history and with every one of the thirty-five municipalities that are part of the Geopark. The ancient sea is the core argument that links with all the elements of the story that the Geopark has to tell the visitors. And this is guiding thread across the guide.

The book is about 190 pages long and includes all the general information for the visitors (festivities, cultural events, gastronomy, the main stakeholders and official partners of the Geopark,etc.) but also information about the UGGps, sustainability, the UN SDG, and the nearest Geoparks. All this information complements the description of the main cultural, historical and geological sites.

The guide was elaborated by a professional that spent 25 days travelling, experiencing and living what the Geopark is, has and offers. The result is a very exhaustive and useful hand guide for those visitors that want to taste and squeeze the essences of the territory.

The guide was written originally in French, but then it has also been translated to Catalan and Spanish to reach the closest markets that, of course, are the main source of visitors.
The publisher sells the paper and digital formats (online and App) at the origin. The paper editions in the three languages are distributed at the destination.

This guide is the first one that this publisher has ever made exclusively based on a Geopark. Their interest is another sign that Geoparks are becoming territories over which attention is generated, and they may take advantage of it to keep going on as they do.

EXPERIENCE THE ICE AGES AT ALL AGES

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Keywords: Children Grown-ups educational tour, experiencing the ice ages.

UNESCO Geopark "De Hondsrug" takes its educational responsibilities very serious. The area of the Hondsrug Geopark is a very popular holidays destination, but many of the visitors are unaware of the geological history and cultural significance of this low range of glacial hills. To remedy this deficiency, UNESCO Geopark De Hondsrug has set out to provide information about the geological and cultural history of the area in a playful manner. We have decided to do this by designing two walking tours, a short one for children and a longer one for grown-ups. Themes will be the Mammoth and the sabre-toothed cat that once roamed this area.

As a location for these educational hikes we have selected the Hunzebos, a forest located near the town of Exloo, in a scenic area where many of the special features of the Geopark can be found: glacial hills and valleys, tumuli, a hunebed (megalithic grave monument) and picturesque towns. The Hunzebos forest itself also contains many of these glacial and archeological remnants, which will be included in the hikes.

The children's hiking tour (about 2 km long) winds through the hilly Hunzebos. Along the way we have designed 10 play objects, where children are challenged to test their speed, agility and wits against the sabre-toothed tiger, a formidable beast that once roamed these woods during the last ice-age. The play objects are constructed of Robinia wood, a strong, durable and sustainable timber; they include a cable way, a swinging rope and adventurous bridges and other objects that invite playful learning.

Next to the children's hike a hiking tour for grown-ups has been laid-out through some of the prettiest scenery of the area: old and new forest, heathland, old agricultural farmland and the enigmatic range of hills called the Leewal. Along this 7.5 km trail some learning experiences have been installed, which will inform the hiker of the fascinating ice-age history. These learning experiences can take the shape of a physical sign presenting information about past events in a playful way. Other ways to present information are virtual reality or augmented reality information, which can be accessed via the smart phone.

In this way Geopark de Hondsrug aims to make this part of the Geopark more attractive to interested visitors.

WINE IN GEOPARKS: HOW TO INTRODUCE GEOLOGY FROM A BOTTLE OF WINE

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Keywords: wine, subsoil, best practices, sustainability, geotourism.

By drinking a glass of wine, people can taste geology. Earth sciences, and geology, are often seen as hard to understand. Wine, which gather people and bring pleasure, is a great way to introduce geology smoothly. In June 2019, all European geoparks received a survey from the Beaujolais geopark aiming to get a big picture about how the wine topic is approached and considered. Answers received highlight a global dynamic in Europe about wine. Around ten geoparks have vineyards, working with very different varieties of grapes and soils. The questionnaire reveals many initiatives.

The Geopark Beaujolais has a great diversity of soils and subsoils that gives its single red grape variety, the Gamay, a wide range of taste. Over 10 years, the Beaujolais has characterized all its soils and subsoils offering today one of the most detailed work for a wine area in the world. Rich of this deep knowledge and of the UNESCO Global Geopark label, wine stakeholders want to find a way to better share the fascinating story of wine and geology. Many initiatives are growing in the region such as bottle labels, vines garden, wine tasting, interpretation center, trainings, videos, school presentation, etc.

TOWARDS A BETTER UNDERSTANDING OF GEOTOURISTS

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Keywords: geotourism, geotourists, storylines, landscape art

The Flemish-Dutch Scheldt Delta region has aspirations to acquire the UNESCO Global Geopark status. As a Geopark accreditation opens doors to attract a new market segment of geotourists, it is valuable to know the opportunities that could be accessed by this special interest market. It seems that there are not many studies on how a Geopark enriches the tourism industry. Therefore recently on behalf of the transboundary Aspiring GeoPark Scheldt Delta an extensive study was carried out to get a better understanding of geotourists, including in-depth interviews with individuals interested in geological tourism.

Three concepts are important to understand (geo)tourists; push motives, pull motives and information collection. Push motives refer to socio-psychological drivers and initiate travel behaviour. Pull motivations involve destination-specific assets that lead individuals to choose a particular destination. Third, information collection occupies an important role in bridging gaps between push and pull motivations. Additionally, on-site information is considered relevant in geotourism contexts.

Findings indicated that pull factors encompass natural, geological and cultural resources. It is remarkable that geological resources do not constitute an initial motivation for geotourists influencing whether to choose one destination over another. Yet, the presence of unique geological phenomena increased the attractiveness of a certain destination. Consequently, natural resources were linked to escaping from daily life, physical stimulation and mental relaxation, whereas geological resources were associated with novelty-seeking and personal enrichment. Moreover, research confirmed that the gathering of information of geotourists occurs to a great extent on-site.

Experiences for geotourists include three dimensions; experiential, reflective, and social. Whereas the experiential and reflective dimension may explain geotourist behavior in general, the social dimension applies to geotourists travelling in groups.

Geotourism is a market segment showing potential to develop tourism in regions that are nowadays less visited by tourists. Geoparks do also form an opportunity to spread tourism. Nowadays, within Aspiring Geopark Scheldt Delta both the Flemish and Dutch coastline is heavily visited by tourists, whereas the inland, with lots of geosites is less visited. The inland has many opportunities to improve the geotourism potential, such as emphasizing the natural resources and facilitating the on-site information needs of geotourists. At this moment several regional initiatives has already started to strengthen the attractiveness and experience of our geosites, among others by the use of landscape art. This is done in combination with the development of various thematic storylines that connect geosites and initiatives using the concept of a metro map. Investments in branding and on-site information provision will always be required.

CARRYING CAPACITY FOR TOURISTIC USE OF GEOSITES: AN APPLICATION TO AZORES UGGP GEOSITES

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Keywords: carrying capacity, TURGEO project, Azores UGGp, geosites, touristic use

The Tourism sector growth in the Azores Islands is evident mostly since the liberalization of the airspace in 2015: from a total of about 1.23 million overnight stays in 2014 to almost 2.64 million overnight stays in 2018 (being the average stay 3.1 days). And Azores Islands are a Nature destination, where the scenic beauty of its volcanic landscapes, the wide geodiversity of the islands and the several geotourism experiences provided to visitors (e.g. trails, thermal baths, geo-cooking, etc.) play an important role.

Under this framework, the Azores Regional Government and the Azores UNESCO Global Geopark (UGGp) are working towards the sustainability of Azores Tourism and geoconservation policies, being the definition of carrying capacity for touristic use of geosites an important tool to achieve such desideratum. As geotourism experiences often take place in geosites – that are also iconic geolandscapes or well-known touristic spots – it becomes crucial to define and establish control measures to ensure the integrity of such geosites, especially those with higher vulnerability and under more visitors pressure.

Those are the main purposes of the TURGEO Project – "Definition of carrying capacity for touristic use of geosites", financed by the EU Program "POAÇORES2020" and the Azores Government/DRCT (Ref: ACORES-01-0145-FEDER-000064) and coordinated by the Azores University, in cooperation with the Azores UGGp and the Azores Tourism Board.

The Azores UGGp includes 121 geosites, 105 of them with touristic use. Many of those geosites: i) are well equipped with support infrastructures (e.g. parking areas, sanitary facilities); ii) embrace outdoor activities (e.g. trails, baths); iii) have interpretation tools (e.g. visitors centers, panels), and iv) have available information (e.g. web links, digital flyers). Nevertheless the concentration of visitors in many of the most emblematic geosites imposes the need to define its carrying capacity as only 11 of these geosites have a defined carrying capacity.

The ongoing work under the scope of TURGEO Project includes the establishment of a methodology to define the carrying capacity for touristic use of geosites, and its application to selected geosites from the islands of São Miguel, Terceira, Graciosa and Pico. The geosites were selected taking in consideration its touristic pressure, size, management, protection status and its typology (e.g. wide geolandscapes, volcanic caves, urban areas, thermal areas and natural reserves).

As this work is integrated in the geoconservation strategy of the Azores UGGp, a special attention is given to the Furnas Volcano Caldera geosite of international relevance and ex-libris of the Azores Tourism, where additional studies were implemented. Available preliminary information from data collected in the three main road entrances to this geosite indicates up to 5,030 visits/day to the geosite, about 32% of them being visitors that access the geosite by rental car or bus (cf. about 493 rental cars/day).

ARCHITECTURE SERVING THE SIGNAGE OF CHELMOS – VOURAIKOS UNESCO GLOBAL GEOPARK

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Keywords: signage, visualization, communication, architecture, geoparks.

Chelmos – Vouraikos Unesco Global Geopark became a member of the Global Geoparks network in 2009, and since then 40 geosites of national and local importance, expanding all over its territory, such as the Cave of the Lakes, the Styx Waters and the Vouraikos Gorge, have been defined. Most of the geosites represent the main geological structures and the rocks of the geopark, important geomorphosites and geological features related with surface and underground water.

The appropriate signage of the Geopark‘s area has been always a priority for the Management Body of the Geopark as it has been proved by its inclusion to the Action and Strategy Plan. Due to its revalidation Chelmos – Vouraikos Unesco Global Geopark has tried to improve the infrastructure of its visibility, providing new geosite gateway signs, interpretation-educational signs, and directional signs. Since 2016 new signs have been placed in the Keramidaki-Kastro trail in the frame of the EPA-Greece-Italy funded project. Nevertheless, after receiving a CLLD/LEADER funding the new signage infrastructure has been reconsidered. The objectives of the new signage is the enhancement of the importance and recognizability of the Geopark, the awareness of visitors and local community, the encouragement of visiting and exploring the Geopark and the increase of visitors turnout.

In order to achieve these objectives, architecture principles were applied to the signage design. The main architectural approach is the innovative and minimal design, the intergradation into the landscape, and at the same time the visibility in variable weather conditions. The materials that were selected for the construction of the new signs are a rusty steel frame fixed on a concrete cast groundwork base, where earth colors prevail and match well with the landscape. The scientific information about the geology of the geosites and their respective biodiversity was kept as simple as possible accompanied by simplified images that would help the average visitor to digest and understand the respective geosite.

We hope that our new signage will promote further the geopark and will awake the interest of geotourists.

SAIMAA ASPIRING GEOPARK CYCLING ROUTES

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Keywords: Saimaa aspiring Geopark, sustainable development, cycling.

Biking is a very versatile form of exercise and it is suitable for almost everyone, regardless of age and previous experience. Finland has excellent conditions for biking, with varied routes available in cities and in the Lake-Finland district and Saimaa aspiring Geopark is beeing a part of that. Our aim is to encourage visitors for responsible tourism with as less harm to nature as possible. Cycling is an ideal way to visit geopark sites. There are sites available for all types of cyclists with easy access and with more advanced destinations.We even work with crossborder (Russia - Finland) routes via Vuoksi valley, in Imatra City.

There already exist some routes, but several routes still need development and more advanced services. Important aspect is to pay attention to sustainable development of services. Here are examples of routes already in use:

A)The greater Saimaa route (360/520 km). The bicycle route around Finland's largest waterway, Saimaa, is a dream destination for a cyclist who enjoys lakeside scenery. National landscapes, historical sites, small villages and bigger cities can all be found along the way, offering plenty of variation.

B) The archipelago route in Puumala is a spectacular scenic trail for cyclists. The 60-km circular route, immediately became popular. It winds through some of the most breath-taking islands, bridges and eskers in the Saimaa region. Along this route there are several Saimaa aspiring Geopark sites.

C) Easy access to geosite Lammassaari (3,7 km), which is a delta belonging to the First Salpausselkä's ice-marginal formation and it began to accumulate around 12,300 years ago. Only a small piece of island to the south remains at the original height of the delta; elsewhere waves at different stages of Saimaa's development have washed away deposits and formed clearly distinct ancient shorelines. Two Stone-Age settlements have been found on the shores of the Greater Saimaa stage. Several kettles serve as remnants from the ice age, with the biggest being a rather large, steep-edged kettle pond. There are beautiful and representative gneiss vein boulders along a path to the north of the island, and a sheltered rocky area at the northernmost point.

In Lake Saimaa area cycling has always been a natural way of moving. The size of the lake has given possibility to create a large variation of routes around and by the shores of the lake.
Many Saimaa aspiring geopark destinations can be reached by bike or by MTB. To combine diffrent destinations to an interesting combination for a visitor is a challenge for us. Tourists and locals want to experience things and even moving from one place to an other should be an experience. The lenght and accessibility are suitable for families and for active cyclists.

DESTINATION REYKJANES – THE IMPORTANCE OF REYKJANES UNESCO GLOBAL GEOPARK IN DESTINATION MANAGEMENT

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Keywords: Geoparks development, sustainable development, destination management plan, tourism.

Reykjanes is one of the less known tourism destinations in Iceland. At the same time tourism is an economic driving force in Reykjanes. It generates jobs and contributes lifestyle benefits to the community but that needs to be managed and monitored to ensure a positive legacy for current and future generations.

In 2016 the Ministry of Industries, Tourism and Innovation launched a project on Destination Management Plans (DMP) for all regions in Iceland. The project was led by the Icelandic Tourist Board and operated by the regional visit offices. DMP is an important tool for future development of tourism within the region, as it is an ongoing process in which tourism, industry, government and community leaders plan for the future and manage the destination. It is a holistic process that ensures tourism adds value to the economy, social fabric and ecology of the community.

The Reykjanes peninsula – the home of Reykjanes UNESCO Global Geopark - is one of seven regions in Iceland that have published a comprehensive plan so far. Reykjanes Geopark has played a major part and contributed to the work of comprising the DMP for the Reykjanes and served as the foundation for future development of the tourism in the region.

The DMP report highlights key themes on which the region needs to focus on in the future including tourism research, information, communication and education, nature, project development – product development, information and safety, roads and transportation and marketing. The Reykjanes Geopark has had a leading role in managing many of the individual themes and has been actively included in others.

Being a UNESCO Global Geopark makes Reykjanes a unique destination and that is a key factor in the marketing plan for the region. The Geopark is in the top five list trending in Reykjanes and visitors highlight geosites as sought-after destinations in the area. Building on this interest, the Geopark has been actively implemented in Iceland's tourism campaigns. This has been done in close cooperation with Promote Iceland, a public-private partnership established to lead the promotion and marketing of Iceland in foreign markets and stimulate economic growth through increased export.

The presentation provides an insight to how the Geopark has contributed to the DMP work, the role and status it has within the tourism in the region and the major impacts it has on the marketing communication plan for the destination Reykjanes Iceland.

LOCAL PRODUCTS AS LOCAL DEVELOPMENT ENGINE - GEOFOOD

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Keywords: Tourism, Local products, stakeholders, Sustainable development

Traditional and local products, which have been undervalued, are now considered to be high quality products, often of highest quality. They constitute a structural factor in the development of rural territories. Its production is closely linked to the rhythms of nature and the traditional know-how, contribute to the preservation of the landscape and local identity. Traditional agricultural and food products are now in vogue as enhancing instruments for agricultural and rural development, supporting tourism development in certain territories. Local products are thus seen as a fundamental element in rural planning, landscape preservation, nature conservation, the fight against desertification and depopulation of rural territories. Local products are mainly produced for self-consumption and local consumers use them as products that are part of their eating habits.

The tangible interest in traditional products as integral elements of rural development policy is being taken into account within the management units of the Geoparks. These latter have made the skeateholders aware that investing on local products can be an engine of economic and social development for the rural territories.

The GEOfood is a concept invented by Magma UNESCO Global Geopark for local food, producers and restaurants working inside an UNESCO Global Geopark. GEOfood is characterized by specific criteria which aim to link together the local products and the local peculiar geodiversity.

Magma UGG is working to strengthen the GEOfood brand internationally, including more UNESCO Global Geoparks (UGG) who would like to have the use of the brand, and the promotional page. At the moment seven UGG are using the GEOfood brand. Magma UGG welcomes all UNESCO Global Geoparks to request such brand in order to support the rural areas and the local communities, helping the use of local products, which influence on the reduction of inequalities, the food waste and also the reduction of CO2 emissions. GEOfood works around the food system as a whole. So, this project makes the local producers aware, brings them closer to the consumer and increases the knowledge about local products, contributing to the valorization of food along the production-transformation-distribution-consumption channel. This permits to integrate the agricultural products into the territory and offer larger gastronomic diversification to the restaurants through a review of their menus. The project is based on technical system support and consult and consumers. The strategy of this project is to work the local system in order to appreciate it, making it healthier and sustainable.
The GEOfood project in Terras de Cavaleiros UNESCO Global Geopark already has 39 restaurants, 10 producers and a pilot project with the Restoration course of the Group of School Macedo de Cavaleiros through the creation of two sweets ("Granadas" - Garnets and "Umbiguitos" - belly button), mainly made with local products and inspired in the local geology.

THE CONTRIBUTION OF GEOTOURISM FOR REGIONAL SMART SPECIALIZATION STRATEGIES: THE PERSPECTIVES OF GEOPARK MANAGERS OF EUROPEAN ATLANTIC AREA

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Keywords: Geotourism, Smart Specialization Strategy, Geoparks regional development managers

The theory of Regional Smart Specialization Strategy advocated and supported by Foray et al. (2009) and Foray (2014), based on the potential of regions, through their resources and assets, with characteristics of inimitability and non-transference, are able to create tradable goods and services and reinforce the regional competitive advantages. These resources and assets may be technological (analytical and synthetic knowledge) or non-technological (eg symbolic knowledge and capital). According to the Guide on Research and Innovation Strategies for Smart Specialization (RIS3 Guide), regional governance, within the framework of European public policies, must respect the quadruple propeller model that is a process of entrepreneurial discovery. In many cases, the endogenous resource as singular geological heritage of international relevance stimulates geotourism activities as driver for economic growth. In such cases, it seems that smart specialization in this thematic focus is justified and multiple positive impacts are expected from such territorial strategies. In this framework, in Europe, the "Atlantic Geoparks Project", an INTERREG cooperation project inside Atlantic European Area Program, promoted by UTAD in partnership with 10 UNESCO Global Geoparks (UGGp) and 2 aspiring territories in 5 countries, aims the creation of an innovative concept the "European Atlantic Geotourism Route". The study now presented approaches the UGGp included in this project, showing the perception of geopark managers members of "Atlantic Geoparks Project", on the role that such UNESCO designated areas play in the process of economic local development. The objective of this study was to analyze and evaluate the geopark managers expectations on geotourism regional smart specialization strategy and the effective impact (positive; negative; or neutral) in the different territories of this partnership. The methodology employed in this work is qualitative in nature and semi-structured.

Our results show that the majority of UGGp managers consider that Geotourism could be an effective contribution for growth and development of regions of low density. Due to this reality, a regional smart specialization strategy in this topic will promote an effective entrepreneurship and jobs that contribute to an inclusive and sustainable growth, trough the ability to transform innovation and knowledge while at the same time pursuing a policy of cohesion and competitiveness as defended by Capello (2016). On other hand, some UGGp managers refer that the perception of the different stakeholders / trade (politicians, companies, customers) about geotourism is not yet adequately updated in accordance with a territorial development approach but rather a diversification of tourism activity supply in a niche product related with geological tourism only. Geotourism and geoparks are growing around the world and could be an opportunity to contribute effectively for the regional competitiveness and development namely the 2030 Agenda for Sustainable Development defined by UN.

ARCHAEOLOGICAL HERITAGE AND HUMANIZED LANDSCAPE: A LINK BETWEEN GEOLOGY AND HUMANITY FOR THE DEVELOPMENT OF A TRANSNATIONAL GEOTOURISM ROUTE

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Keywords: Archeological heritage, Arouca UGGp, European Atlantic Geoparks, Sustainable Development, Geotourism.

The European continent has been the scenario of an extremely rich and complex human history, since prehistory until nowadays. Regarding Paleolithic, Mesolithic and Neolithic times, the surviving materials left by our ancestors are materialized in different stones, ranging from lithic artifacts to megalithic monuments and passing through artistic expressions carved and painted in diverse rock surfaces. The European Atlantic Area is especially rich in this kind of human heritage, displaying a remarkable proximity and even a geographical overlap between the location of prehistoric sites, archaeological remains and geosites. Some examples can be found in the Arouca UNESCO Global Geopark (UGGp) in Portugal, where admirable stone tools, such as arrowheads or tiny greywacke beads were found in prehistoric graves built with schist and granite. Other examples occur in the Basque Coast UGGp (Spain), where amazing Paleolithic paintings of horses are displayed in the Cretaceous limestone of the Ekain Cave. Or in the Marble Arch Caves UGGp (Northern Ireland / Republic of Ireland), where is possible to observe an impressive landscape of prehistoric monuments in the Cavan Burren Park, composed by megalithic tombs, hut sites and pre-bog walls in the context of a Lower Carboniferous limestone bedrock. In this wide European Atlantic Area, there are several UGGps in different countries, where similar human actions are adapted to different landscapes and shaped by distinctive geological features. While those phenomena tell stories about diverse geological episodes of planet Earth formation, it also gives information and knowledge about common periods of human history.

With this work, we intend to discuss the role and importance of the archaeology to build-up interesting and long-lasting interpretative discourses, which bring humanity and geology close together. In this context, it is our conviction that archaeology is a key-knowledge to understand the different timelines on UGGps and to explore the human dimension and their links and reconnection with geology. At the same time develops the promotion of dialogues focused on the relationship between humans and environment, through different spaces and times. This is one of the main goals of the European Atlantic Geotourism Route, which it will be created under Atlantic Geoparks Project, approved by INTERREG Atlantic Area Program, in order to contribute for developing local economy and sustainable tourism. In this context, the archaeological heritage may contribute strongly for the diversification of remarkable geotourism destinations, working both for local communities and for visitors.

Starting through the promotion of initiatives that involves prehistoric archaeological heritage, we seek to contribute for the enrichment of the European Atlantic Geotourism Route, exploring different ways of linking and interpreting human and geological realities.

TOOLS AND METHODOLOGY OF MEDIATION FOR A WIDE APPROPRIATION OF GEOLOGICAL HERITAGE IN THE MASSIF DES BAUGES UGGP

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Keywords: Education, Communication, Geoheritage

All our public presentations (presentations on the field, "pedaledconférences", invited conferences, annuals conferences cycle during EGN Week and formation days all year along) are occasions for us to developand improve a truelanguage to share geoheritage with all our partners and the general public. This process allow us to built ready to use resources, like illustration, movie clips and 3D Models (physical or virtual), to provide our partners, visitors, website with quality productions.

An iterative approach that allow us to build a body of knowledge to establish a progress dynamic in the time. A work realized internally to keep track of the entire process and its evaluation.

Providing adapted geological information for a diverse public audience is a key challenge for Geoparks. The information must interest the public in people's relationship with the Earth in a very attractive way, avoiding the trap of being too complex or academic. Pictures and cartoons are keytools for increasing the public's understanding and awareness of geoheritage, natural resources, and sustainable development. These graphics can provide attractive and educational ways to present information in an accessible way and they use an integrated approach to address the specific needs of the public. Creating these images is not within the scope of an ordinary graphic designer or info graphist. It requires a combination of skills: (1) a good understanding of geological concepts; (2) design skills and a good grasp of animation software programs; and (3) an understanding of pedagogy and science-popularization approaches to ensure the geological concepts are presented appropriately for the intende daudience.

We present the experience of the Massif des Bauges UNESCO Global Geopark to show how we integrate this communication at various levels. The aim is to explain the landscape and geoheritage in the form of a story. We present small stories about each of our sites, but also put them in the perspective of the larger stories of geological and human history. We use different approaches to illustrate this dynamic, taking into account the specific details of the sites and ourpartners there, and integrating this into a global coherence.

The pictures, cartoons, videos, applications and panels illustrate the decision-making process involved during the production process and the application of the threes kills described above. The gap between the available resources an dissues involved in this work indicates that there is a wide range of possibilities and a place for new skills in the crucial domain of geoheritage popularization, providing layman-friendly geoscience information and ensuring sustainable development.

WINTER GEOPARK: A NEW PROGRAMME FOR A NEW APPROACH AT CABO DE GATA UNESCO GLOBAL GEOPARK

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Keywords geotourism, seasonality, geology.

As in most Mediterranean coastal areas, the influx of visitors during the summer in the Cabo de Gata-Nijar UGG is huge, but during the low season, the influx of visitors decreases. This minimum match perfectly with the best time of the year for hiking at the UGG, because its subdesertic climatology. It is from November to April when the weather is gentle and hiking is not a risk, such during the summertime, due to the high temperatures. To combat seasonality and thus reinforce the role of the Geopark and also the dissemination of the magnificent and unique geological heritage of the Geopark, since 2017 work began on the program "Winter Geopark". In this program, through field outings every weekend from January to April adapted to all levels and all tastes. Georoutes, astronomical observation and many more activities were part of the first edition.

During the first year of its run the success of the attendance was so important that in 2019 the Sierras Subbéticas UNESCO Global Geopark joined the program for the second edition thus becoming a regional program. A new wave of activities was added, like bike georoutes, with a warm welcome by the public. The activities were celebrated every weekend in alternated UGGs collaborating with local enterprises, which operates the whole year within the territory and are usual collaborators and partners of both geoparks. Through this oral presentation we will share the experience.

GEOLOGICAL HERITAGE & RESEARCH IN GEOPARKS

THE SPREADING FOSSIL HERITAGE, HOW TO VALORISE THE LITHOGRAPHIC LIMESTONES OF THE MEIÀ QUARRY IN THE CONCA DE TREMP-MONTSEC UGGp

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Keywords: Heritage, fossil Lagerstätten, Lithographic limestone, Virtual museum.

Conca de Tremp-Montsec UGGp (Lleida, Catalonia) is characterized by the rich Mesozoic fossil heritage, mainly from Cretaceous ages. One of the most impressive fossil collections comes from the fossil Lagerstätten of Meià Quarry (Vilanova de Meià municipality), which have provided a huge amount of lithographic limestone slabs with vertebrates, non-vertebrates (including insects), plants and coprolites of Aptian ages (Lower Cretaceous, about 125 my) preserved as two dimensional structures that shows even the soft parts of their morphology.

This palaeontological site is known to provide one of the most primitive angiosperms plant (*Montsechia*) or the presence of two different primitive bird specimens (*Noguerornis*). Moreover, the site has yielded about 46 holotypes and paratypes, which gives a real indication of its paleoecological importance.

Nevertheless, this site is almost unknown around the world, except for the specialized researchers, because these fossils have been spread in several collections. The early beginning of the commercial exploitation as a lithographic limestone quarry, in 1898, and the weak palaeontological Spanish scientific network during the first 75 years of the 20th century allowed the uncontrolled collection of the fossils from both European universities and local amateurs.

This situation has changed with the implication of the Institut d'Estudis Ilerdencs, a scientific and cultural branch of the Diputació de Lleida (Lleida Government) which was implied in the excavation of the site and kept a collection of more than 4.000 thousand fossils. This collection will be the basis of an interpretation centre housed in the Geopark, in the town of Vilanova de Meia and it will show the most interesting fossils found in the quarry of this municipality. Therefore, this exhibition will return part of the heritage of this small village that will use it as a development tool for tourism and education. Moreover, it will become one of the attraction points in the Geopark, which will explain the story of the Lower Cretaceous period in this area.

Finally, in order to assign the real importance of this palaeontological site, a global European database of the spread fossils is being built to disseminate them on a virtual platform. This site has provided 151 different species and, more interesting, 39 holotypes have been described from the Meià Quarry. Because of more than 8,000 fossils are deposited in 12 European museums, this virtual database will be a successful tool to visualize the most amazing fossils of the Meià Quarry as a whole unit.

MIDTERM-RESULT OF THE PINGO PROGRAMME IN DRENTHE, THE NETHERLANDS

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Keywords: research, geoheritage, education, participation.

The surface of the province of Drenthe in the Netherlands has got a large number of (almost) round depressions. Many of them are presumed to be pingo-remnants. A pingo is a permafrost landform, an earth-covered ice hill formed by an ice lens that pushes the overlaying sediment upwards while growing. In the last phase of the Weichselien, the soil on top of the ice lens melts and the sediment slides mainly sidewards. Later on the complete lens melts and a circular depression, sometimes surrounded by a rim, is left.

In the present time the northern part of the Netherlands covers the biggest amount and concentration of those pingo remnants in Europe, they form an important part of the glacial landscape scenery.

Many pingo remnants initially formed open water and most of them were slowly filled with Late Glacial – Holocene lake sediments and peat which strongly reflect environmental conditions of the past and the present. They are valuable for earth- and nature science and often they have ecological, archeological and cultural values. Anthropogeneous impact already started in Mesolithic and Neolithic times. Later on they were used for washing sheep and many people in northern Netherlands learned swimming and skating in pingo remnants nearby their villages.
In order to get more insight in the genesis of pingo's and to raise awareness and better management in 2016 the Pingo Program started: an integrated approach initiated by the Hondsrug UNESCO Global Geopark organization together with the province of Drenthe, landscape- and nature organizations and the Universities of Utrecht and Groningen. The Pingo program involves a wide range of organizations, disciplines, researchers, students, volunteers and inhabitants. The program has led to new insights in the genesis of pingo-remnants and also pseudo-pingo's are unmasked. From the 2500 depressions found, we now know of about 250 locations what they are: 100 pingo remnants, 40 probable pingo remnants, 80 windblown depressions, 25 other kind of depression, like pits or small valleys etc. This information comes from literature and fieldwork. The fieldwork of the Pingo Programme is realized with students and a lot of volunteers.

The preliminary outcomes of this approach will be presented at the conference. We will focus on the research, but also on the educational, geotouristic and management tools that are developed.

URBAN GEOSITE ASSESSMENT: THE EXAMPLE OF CLERMONT-FERRAND IN FRANCE

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Keywords: geosite inventory. urban geoheritage. geoheritage management, sustainable development, Clermont-Ferrand.

The constantly increasing interest in geoheritage management over the last decades is mostly focused on natural or semi-natural areas. In these, geodiversity elements of the nature are generally preserved as complete objects by their static protection and popularization is the priority. In urbanized areas, where built-up zones usually increase steadily and there is a tendency to put concrete everywhere, natural heritage, like geoheritage is suppressed / isolated into limited niches. Potential geosites become highly vulnerable, as natural features could disappear easily with housing projects, or they could be modified irreversibly by inadequate stabilization of slopes, for example.

An assessment of geoheritage is carried out inside the city of Clermont-Ferrand, the regional centre of Auvergne in France, only kilometres away from the Chaîne des Puys – Faille de Limagne natural World Heritage site. More than 50 sites were inventoried using the workflow of the French National Invenotry (Inventaire National de Patrimoine Géologique). This was done with expert consultation, detailed, street-level coverage in the field, cartographic and satellite image validation. Being a semi-quantitative assessment method, sites are numerically associated based on different factors such as primary geological interest or potential vulnerability by anthropogenic threats. A differentiation between highly and moderately valuable sites are created this way, but we proposed to include every recorded geological outcrop or landform in the final inventory. Sites are highly fragmented because of built-up areas, each of them requiring a customized management strategy, as they are potentially exposed to irreversible changes. We also created a geomorphology map that includes all areas even if urbanized. This helps to place each geosite in its natural context that aids understanding and provides the city with a geomorphological template on which to base future planning.

Urban geosites are essential part of the cityscape, however their importance is not acknowledged adequately yet. The geosite inventory of Clermont-Ferrand gives the chance to raise the awareness about the need of their proper management and protection, such as stabilization of slopes respecting the geological values. The geosites also protect a valuable ecosystem that improves the living conditions of the city. They can be integrated into the life of the city and could be used for recreational, educational activities (school group visits, university courses) and touristic itineraries as well. Popularization of geosites could improve the environmental awareness of local citizens too, promoting active participation with projects like management of sites with community involvement or crowdmapping for increasing the coverage of the inventory.

INTERNATIONAL CONTACTS OF THE NATIONAL GEOPARK RIES, BAVARIA, GERMANY

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Keywords: Geopark Ries , impact crater , international contacts, space missions.

Located in southern Germany, the Geopark Ries is one of best preserved impact craters on Earth. Since the Geopark Ries was established in 2005, this area has been of particularly great international scientific importance.

As one of the best preserved impact craters on Earth, the Geopark Ries maintains close contact to NASA (National Aeronautics and Space Administration), ESA (European Space Agency), DLR (German Space Agency) and also to MPI (Max-Planck Institutes) which are involved in space missions, for example, the MPI for Solar System Research.

The Geopark Ries is an ideal location for geological field training. Due to the excellent preserved ejecta blanket and several very well exposed outcrops and quarries, this area is the perfect site for acquiring an impression of an impact crater. The Ries Crater is a complex impact crater with an inner-ring zone. Because of this morphology, it is an analogue for craters on the Moon and on Mars.

Continuing a tradition that began in 1970 with geological field training for Apollo astronauts, the Ries Crater served as a training site for the ESA-ISS astronauts in 2017 and 2018.

During their training in the Ries in 1970, the astronauts of Apollo 14 and 17 became familiar with typical impact geology in order to be able to determine—on the lunar surface—if the craters were of impact or volcanic origin.

The ESA-ISS astronauts were prepared in the Geopark Ries for recent lunar missions and even for Martian missions. Since spacecraft have shown us that impact crater structures are the main features on our Moon and on Mars, it is of great importance to acquaint astronauts with those geological structures.

Early in the 2010s science teams of the ESA-Rosetta mission and the NASA-DAWN mission came to the Geopark Ries for geological field training.

The ESA-Rosetta mission was a very successful space mission to the comet Churyumov-Gerasimenko. This mission was the first comet mission to put a lander on the surface of a comet. This lander presented an incredible number of images of the surface of the comet.
The objectives of the NASA-DAWN mission are to visit one of the largest asteroids in our solar system Vesta, and also to visit the minor planet Ceres.

Quite recently the Geopark Ries became of great importance to astrobiological studies because of the excellent preserved Ries-Lake sediments. One of the main goals in geobiological studies is the search for life on other planets, for example, on Mars.

One of the main tasks of the Geopark Ries is to create new geosites as well as to maintain already existing geosites. Due to the work of the Geopark Ries, significant geosites are available and offer excellent windows into the Earth's history, especially into the impact history of the Ries Crater.

MEGALODON AND FRIENDS: A NEW GLIMPSE INTO THE MIOCENE PRIMORDIAL NORTH SEA OF NORTHWEST GERMANY

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Keywords: Geological heritage, Communication, Miocene, *Carcharocles megalodon.*

The Nature and UNESCO Global Geopark TERRA.vita is located in NW Germany and encompasses the mountain ranges of the Teutoburg Forest, Wiehen Mountains, and Ankum Highs. The geopark comprises a 1,550 km² large area and covers 300 million years of near-continuous geological history. However, so far little is known about the Miocene history of the region, and the existing knowledge is based solely on information from drill cores. To increase this knowledge, the geopark and the Natural History Museum Museum am Schölerberg, Osnabrück, a partner of TERRA.vita, carried out excavations in Miocene marine sediments of the Ankum Highs. The excavations have yielded a very rich fossil content and for the first time allowed detailed reconstructions of the Miocene palaeoenvironment of the region.

The lithology of the site is dominated by glauconitic fine-grained sand and weakly consolidated sandstone, intercalated with cross-bedded yellowish white conglomeratic sands. Thus, the sedimentary succession indicates a shallow coastal marine environment; which was located close to the southern coast of the primordial North Sea. The lithological changes suggest frequent shifting of the coastline. In particular, the conglomerate sands are rich in slightly reworked fossils, comprising vertebrae and ribs of marine mammals, teeth of toothed whales as well as teeth of at least eight different shark species. The shark teeth include large teeth of up to 10 cm in size, which can be assigned to *Carcharocles megalodon*. They constitute the first fossil finding of this largest known toothed shark in Earth's history in NW Germany.

The excavation itself as well as the scientific processing of the collected material has been conducted in close collaboration with two amateur palaeontologists who had already been active in the area for several years and had built up a great scientific knowledge on Cenozoic marine vertebrates. One of our objectives is to refute a common stereotype of privately engaged palaeontologists as looters. We would like to motivate academic institutions to establish better communication with amateur geologists and palaeontological working groups. In this way, amateur collectors can be introduced to a more professional documentation of their findings and subjected to legal requirements. In return, the geoscientists will benefit from access to previously unknown and well-documented geological and fossil material.

VALUABLE GROUNDWATER RESERVES – AN IMPORTANT PART OF THE GEOLOGICAL HERITAGE OF THE ASPIRING SALPAUSSELKÄ GEOPARK

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Keywords: groundwater, glaciofluvial formations, Salpausselkä, water quality, geological heritage.

The aspiring Salpausselkä Geopark lies in southern Finland, covering the city of Lahti and five smaller municipalities. Salpausselkä ice-marginal formations and their feeder eskers are central features shaping the landscape of the area. The abundant reserves of high quality groundwater found in these formations add to the value of the geological heritage in the everyday life of some 178 000 people living in the area.

Finnish bedrock consists mainly of granites and migmatites. The bedrock of the aspiring geopark is old (almost 2 billion years) and solid. Thus, groundwater is mainly accumulated in the fault lines. As the bedrock groundwater reserves are scattered and quite small, bedrock groundwater cannot be used as domestic water on a larger scale. Instead, the most significant groundwater reserves in Finland consist of groundwater accumulated in glaciofluvial formations, e.g. Salpausselkä end moraines and eskers formed during the last Ice Age. The groundwater reserves of the aspiring geopark are valuable at national level. The largest aquifer, situated in the First Salpausselkä, is among the three largest aquifers of Finland. All of the high quality, potable tap water in the region is groundwater.

The soil layer of the Salpausselkä formations, consisting of mainly sand and gravel, can exceed one hundred meters in thickness within the aspiring geopark. Most of the rainwater infiltrates through the thick soil into the groundwater layer, becoming naturally purified. Because groundwater is formed from rainwater, it is not relict; the groundwater reserves are continuously renewed. The legislation for water withdrawal states that the amount of water drawn must not exceed the amount of "new" groundwater formed. Water consumption in the Salpausselkä Geopark project area is on a sustainable level: less than one third of the renewable groundwater is used. Groundwater quality and quantity is constantly monitored in the areas of withdrawal. Only minor treatment or no treatment at all is needed before water is led to the piping system.

Soil groundwater is easily exposed to contamination and needs efficient protection. Sand and gravel are easy soil types to build on. Thus, a lot of habitation and transport infrastructure is located on Salpausselkä formations and eskers. Most of the population of the area live on top of groundwater bodies, and the groundwater resources are partly located underneath industrial areas. Anthropogenic contaminants, like herbicides, chloride (due to de-icing) and solvents, can can be found in groundwater. Groundwater protection is a very important theme in Finnish environmental protection, and regional groundwater protection plans include extensive lists of measures to secure groundwater quality. For example, urban planning and environmental supervision are used to control the use of chemicals and the location and types of industrial activities.

A SCIENTIFIC PARTNERSHIP FOR RAISING PUBLIC AWARENESS OF KERSANTITE, THE EMBLEMATIC ROCK OF ASPIRING ARMORIQUE GEOPARK

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Keywords: Armorique, Nature Park, Brittany, kersantite, Geology.

The Regional Natural Park of Armorique is a UNESCO Global Geopark candidate and will submit an application for membership during 2019. The territory is recognized for the quality of its geological heritage and benefits from active research in the geolgy of the region. A recent partnership has been developed between the Park and the University of Western Brittany involving the igneous rock kersantite which is emblematic for the territory. Kersantite is a potassium rich igneous rock (lamprophyre) containing the minerals biotite and plagioclase feldspar (usually oligoclase or andesine), with or without clinopyroxene and olivine. It was defined by Delesse in 1851 and named for the village of Kersanton, France. This rock type, which occurs in minor igneous intrusions, is used throughout the territory in religious architecture, sculpture, buildings etc.

This cooperative project has thus made it possible to deploy a rigorous and scientific approach in creating an inventory of Kersantite veins. The results obtained will thus benefit the future interpretation plan for the Armorique Geopark for mediation purposes.

This presentation will present the scientific characteristics of kersantite, explain the various projects and specify the tools that will be deployed to facilitate public awareness.

Minor igneous intrusions, = defined as veins in the text. The author needs to identify the nature of the minor intrusions (veins) – are these sills, dykes or a combination of both.

GEOPARK TORATAU AS AN EXAMPLE OF THE RATIONAL USAGE OF THE WORL GEOLOGICAL HERITAGE

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Keywords: geopark, Russia, Bashkortostan, Toratau, paleoreef

The Southern Urals in Russia is a unique region with rich natural resources and beautiful landscapes. National traditions are based upon a mix of European and Asian cultures as the Ural Mountains is a border between these two continents.

Several geological sections have been found in the area of the Southern Urals, now they are included in the international stratigraphic chart. Some of the most important geological natural monuments are the sections of sediments, which served as the basis for the formation of the new stratigraphic objects of world importance. They include such natural monuments as the standard section of the stage boundaries section (GSSP) Usolka (300 mln. years old), the Far Tulkas section (candidate of the GTSP Artinsky tier), and the Riphean sections of the Southern Urals.

These natural monuments represent the world's geological heritage and meet the requirements of the UNESCO World Heritage Commission. However, only a few of them have the official status and require the complementation of protection and conservation measures.

In order to protect geological heritage, administration and activists initiated a project of the geopark Toratau. It covers the area of approximately 4500 square kilometers and includes 7 geological natural monuments, 10 complex natural monuments, 6 botanical natural monuments, 30 archaeological monuments, and 21 cultural heritage objects. More than 100 animals and 280 plants of planned geopark are registered in the Red Book.

The main geological attractions of the park are the standard section of the Sakmarian stage border (GSSP) Usolka, the mountains of Shikhans Yuraktau and Toratau, which are remnants of paleoreef structures of the Permian period and do not have analogs in the world.

The establishment of the geopark Toratau protects world geological heritage, encourages tourism development and improves the economic situation. The geopark is a natural museum with an important educational function. The infrastructure of the geopark will include tourist and science centers, museums and labs. The educational program of the geopark consists of the lectures and workshops with international experts, scientific trekking and hiking.

A fellowship program in the park will enable researches to make a profound investigation of the natural resources in the area, it will also publish articles in the international journals and make a collaborative project with experts of other regions. International conferences in the Science Center will attract attention to the region on the world scale. The educational program will base not only on the natural heritage but also will cover topics of the sustainable development and cultural traditions.

Geological objects and distinctive biodiversity make Toratau a genuine candidate for the GGN.

"PALEOZOIC" VILLAGES ROUTE THROUGH THE COUREL MOUNTAINS GLOBAL GEOPARK (SPAIN)

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Keywords: Education, Geotourism Stone Heritage Teaching.

Stone used in historical monuments and traditional constructions represent one of the most relevant links between geoheritage and cultural heritage, since specific rocks were widely used by the First civilizations. Throughout the history, different stones have been quarried according to their availability and geological properties, linked to the geological evolution of a region. Besides, used stones reveal the ancient territorial organization associated with the relief configuration, technological advances and socioeconomic factors. In the NW of Spain, the Courel Mountains Global Geopark (2019) has recently created the "Paleozoic" Villages Route for touristic and educative purposes, highlighting the relevance of the local stone in traditional architecture as key point for sustainable development. This traditional architecture involves the art of dry-stone walling declared recently Human Heritage and other techniques used for dwellings and buildings related to cattle and agriculture: stables, watermills and constructions for drying chestnuts included in the local gastronomy.

The "Paleozoic" Villages Route comprises walks to selected traditional villages in stone, surrounded by forests and mountains. The use of a car is adviced as back up. In each village, three of them declared "Site of Cultural Interest" visitors get to know a representative lithology of the Geopark including metamorphic, sedimentary and igneous rocks Cambrian to Carboniferous in age. Rock characteristics such as nature, durability and natural fissuration control the uses of each stone in foundations, walls, balconies and roofs, in close relation to the local traditional architecture. Moreover, another Mesozoic and Cenozoic rocks used for walling and local stone industry as lime ovens, quarrying sites and the current slate quarries with international relevance complement the visit to each village. During the last three years, more than 1000 people have visited "Paleozoic" Villages (including students from elemental and high schools), which took on a new conception about the role of the local geology in the Society.

THE ESTRELA GEOPARK SCIENCE AND EDUCATION NETWORK FOR SUSTAINABILITY

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Keywords: Estrela Geopark, Sustainable Development, Science Networking.

The Network of Science and Education for Sustainability of the Estrela Geopark (NSES), created by the Estrela Geopark in 2018, aims at supporting and fostering applied research in the Geopark's territory, based on an articulated set of interdisciplinary nuclei with close links to the Higher Education Institutions and the national scientific and technological system, highlighting the entities that carry out research in mountain regions. Besides, it will also serve as a catalyst for the new generation of scientists who will benefit from the more than 2,200 km^2 of this Geopark as a living laboratory.

The Network presents a dynamic structure, through a set of nuclei distributed throughout the territory, promoting science and education, and developing scientific research in complementary areas. Each Nucleus is coordinated by a Responsible Researcher (RR) and includes a team appointed by him. The Nuclei develop their R & D activity in articulation with public and private research units and technology centres, whose activity is developed in lines and projects closely related to the Estrela Geopark. Its priority activities will be defined within the framework of the Estrela Geopark's Strategic Plan for Science, as well as within the premises of UNESCO, with priority in the following areas: Geology and Geomorphology, Landscape, Culture and Heritage, Climate and Climate Change, Biodiversity and Ecology, Environment and Natural Resources, Territory Planning and Risks, Tourism, Leisure and Sustainable Development.

Thus, the nuclei aim at creating structures that promote science, education and scientific knowledge, in a collaborative way, based on the establishment of medium and long-term strategic partnerships between different actors of the territory and institutions that carry out research in the various themes of each nuclei, having as main objectives the cooperation in the identification of challenges, joint planning of activities, the definition of projects, the development of studies on the territory of the Estrela Geopark, the sharing of resources and infrastructures and the mobility and / or exchange of resources between R & D nuclei, with the aim of transferring, sharing and disseminating knowledge. In addition to these more specific objectives, the presented Network has as its mission the promotion of territorial cohesion, contributing to the holistic work that this Geopark advocates.

This Network promotes 5 nuclei of science and education in territory: Climate and Climate Change; Underground and Geothermal Water Resources; Biodiversity and Mountain Ecology; Tourism and Sustainability; Geoparks, Geodiversity and Geoconservation. In the medium term, it intends to expand this network to 9 nuclei, promoting its dissemination in the territory, enhancing territorial cohesion, with its activities defined in Estrela Geopark's Strategic Plan for Science.

This holistic strategy aims at putting scientific knowledge at the service of the communities, through an effective citizen science, implementing various activities with the direct involvement of the communities and its promotion.

THE FEN VOLCANIC COMPLEX – A CENTER OF ATTENTION THROUGH CENTURIES

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Keywords: geological heritage, research, mining, carbonatites, rare earth elements.

The history of the Fenarea is the story of a very special volcano and its series of unusual rock types and minerals, which has formed the basis of the settlements in the region, but also led to groundbreaking geological discoveries and heated academic debates.

Geologists refer to it as the Fen Volcanic Complex, located in Nome municipality, in south-eastern Norway, and here one finds that is undoubtedly some of the most extraordinary geological area in Gea Norvegica UNESCO Global Geopark. In Precambrian time (about 580 million years ago) a carbonatite volcano majestically rose over the surrounding landscape. The volcano is now eroded away due to several ice ages, wind and weather. That which makes up today's surface is believed to represent a cross-section through what once was the circular supply pipe below the ancient volcano.

The surface area of the complex is only 4-5 km^2, hence extremely compact. Here you can find several rare rocks and minerals which had been of great interest throughout history. From 1650 to 1927 iron mines were operated on hematite ores within one of the carbonatite rocks, and from 1953 to 1965 niobium was mined in another carbonatite type. Today the rock types at Fen are of major interest due to the presence of rare earth elements (REE). The world's need for such elements is increasing and efforts are currently being made to map the occurrence, and results from this work will be presented during the talk.

GEODIVERSITY INCORPORATION INTO ENVIRONMENTAL AND SECTORIAL PUBLIC POLICIES. THE ANDALUSIA CASE (SPAIN)

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Keywords: Geodiversity, Geological heritage, Conservation, Andalusia

The Public Policies about geodiversity conservation have been traditionally delayed respect the efforts assigned to biodiversity. In order to correct this situation, 2001 was the beginning of a new period in Andalusia, with the firm commitment for the conservation and enhancement of geodiversity in public policies. Two instruments have been taken into account: the Andalusian Geological Heritage Inventory ("*Inventario Andaluz de Georrecursos*", IAG), created in 2004 and updated in 2011, and the Andalusian Strategy of Integrated Management for Geodiversity, approved in 2010. In addition, Natural Heritage Spanish Law 42/2007 has carried out an important advance for geodiversity conservation. Since 2010, a big effort has been developed with the progressive incorporation of the conservation of geodiversity in public policies, both in the new planning instruments as well as the review of existing ones, as the following examples:

- Land-Use Plans. These plans coordinate the Administration's policies: management of uses and protection of the territory. Example: Land-Use Plan of Southern province of Córdoba (2012). In the normative part, article 61 and 63 Territorial protection zones, it includes a list of georesources and indicates that "In georesources only uses related to scientific, didactic, recreational and agricultural uses are allowed, provided they do not affect the same."

- Andalusian Forestry Plan 2010-2015**.** The conservation of geodiversity is widely collected, with the same treatment as biodiversity. It includes a geodiversity conservation program.

- Andalusian Rural Development Program 2014-2020**.** For the first time, conservation, value and dissemination measures of geodiversity have been collected. It is financed with FEADER funds.

- Environmental Planning of Protected Areas: Natural Resources Management Plans; Use and Management Director Plans; Sustainable Development Plans. These plans are being updated, including the Andalusian Geological Heritage Inventory (IAG) and measures for geodiversity protection, conservation and valorization.

Geodiversity is also incorporated in the Andalusia Mining Strategy 2014-2020 and in the Andalusia Integrated Strategy for Inland Sustainable Tourism.

It can be highlight the creation of the Geodiversity Committee in 2017 in Andalusia, an advisory and participation body of the Government of Andalusia regarding geodiversity. Finally mention the effort of Andalusia to promote the figure of geopark, Andalusia has three geoparks and one in the process of designation.

"LITOTECA": A NEW PROJECT FOR NETWORKING AMONG PORTUGUESE GEOPARKS

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Keywords: networking, UGGp, Portuguese Geoparks, rock samples, geodiversity, Geoscience.

Networking is one of the four essentials of UNESCO Global Geoparks (UGGp), together with geological heritage of international value, management and visibility; it is focused not only in cooperation with the local people living in the UGGp, but also in cooperating with other UGGp's, learning from each other and, as a network, increasing the recognition and value of this UNESCO label.

This networking purpose, applicable and disseminated both nationally and internationally, is the basis for this abstract, that presents an initiative among the Portuguese Geoparks: the production, exchange and use of a "LITOTECA" (meaning deposit/archive of rock samples) to support educational, scientific and dissemination/promotion of Geoscience initiatives.

The "LITOTECA" encompasses a representative rock samples collection of the geodiversity from each Portuguese Geopark territory and its geological history, prepared by each Portuguese Geopark staff and shared with the other territory, on an "one for all" basis. Easy to use, made portable and adequately prepared and labeled with a short ID, the geological samples are suitable to be used by the Geopark staff, but also their stakeholders on several activities and for different purposes, from educational activities, to general public sessions, and exhibitions.

The Azores UGGp "Litoteca" includes 12 samples that illustrate the lithological geodiversity of the Azores Islands, including ankaramite, surtseyan tuff, ignimbrite, trachyte, basalt, scoria, pumice, volcanic sand, syenite and fossiliferous limestone samples.

The rock collection of Naturtejo UGGp shows a good representation of the rock cycle, including 27 sedimentary (diamictites to epigenic limestones), metamorphic (pelitic hornfels to gnaisses) and igneous (S-type granites to dolerites) samples.

The Arouca UGGp "Litoteca" includes rock samples of conglomerate, carbonaceous shale, quartzite, slate, metaconglomerate, metagraywacke, black quartzite, quartzodiorite, as well as several granite samples, including the iconic Nodular Granite of Castanheira ("Pedra Parideira/Rocks Delivering Stones").

The Terras de Cavaleiros UGGp collection is constituted by 12 samples representative of oceanic and continental lithosphere sequences and include dunite, serpentinite, gabbro, amphibolite, mafic granulite, and gneiss samples, among others.

The Aspiring Geopark Estrela also contributed to this networking initiative with a rock collection that includes about 30 samples of various granitic rocks, migmatite, dolerite, quartz, schists, shales, slates, hornfels, greywacke, phyllite, as well as glacigenic sediments (till).

NEW METHODOLOGIES OF GEOCONSERVATION IN OPEN AIR PARKS; THE KYRIA APOLITHOMENI PETRIFIED FOREST PARK CASE, LESVOS ISLAND UNESCO GLOBAL GEOPARK

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Keywords: Geoconservation, Petrified Forest, Parks, Lesvos Island.

The Natural History Museum of the Lesvos Petrified Forest (the management body of Lesvos Island UNESCO Global Geopark) in the framework of its mission, which includes the study, research, promotion, exhibition and conservation of the Lesvos Petrified Forest, the most important geological monument in Greece, systematically researches and implements methodologies in recent years, aiming at the integrated promotion of the natural heritage and especially of the geosites and plant fossils.

The project «Conservation and promotion of the Lesvos Petrified Forest - Area Kyria Apolithomeni» financed by the North Aegean 2014-2020 Regional Operational Program, included the in situ conservation of the petrified logs in the Petrified Forest Park at the site of Kyria Apolithomeni, as well as the work required for the effective protection and aesthetic enhancement of the fossils.

Although at first sight the fossils look hard and durable, they are in fact very fragile and are at risk from a number of factors (called environmental parameters) that cause significant mechanical and chemical damage. Environmental parameters including humidity, temperature, rain fall, ice etc are responsible for many of the alterations to fossils. Excessive humidity causes increasement of the volume of the fossils with greater porosity and less hardness. Excessive drought causes cracking and pulverization (conversion of solid surfaces to dust). Excessive heat and excessive cold cause expansion and contraction of the fossils, leading to cracks. Rain water enters the cracks and expands by creating ice crystals due to frost in winter, causing further mechanical damage.

The fossils found in open areas are, in addition, facing a multitude of biological factors and plants often grow on top of the fossils, causing mechanical damage such as cracks.
The preservation and documentation of the fossilized logs at the site of Kyria Apolithomeni requires combined and simultaneous targeted actions for the fragile fragments of the fossilized trees.

The implementation of this project will have a major contribution to the conservation of plant fossils that are so far exposed and are subject to particularly intense pressures from both natural processes (rain, wind erosion, solar radiation, etc.) as well as from humans.

ROLE FOR RESEARCHERS IN (UNESCO GLOBAL) GEOPARKS - BIBLIOMETRIC ANALYSIS AND DISCUSSION ON NATIONAL GEOPARK COMMITTEES

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Keywords: bibliometrics, research, national geopark committee.

The Famenne-Ardenne Geopark as described by Verheyden and others in 2016, is the first Belgian UNESCO Global Geopark since April 2018. Other geoparks are currently under consideration in Belgium, which raises the question of the creation of a National Geopark Committee, its organization and the role of researchers. In this context, a short bibliometric analysis of the scientific literature pertaining to geoparks together with a survey of some national committees existing in other countries to serve as guideline for a future Belgian Geoparks Committee. Moreover a short overview of existing geosciences (research) - related organizations in Belgium may orient (the debate on) the selection of the National Geoparks Committee members.

The bibliometric analysis makes use of frequently used scientific publication databases, i.e. Google scholar, Scopus, and Web of Science. Google Scholar yields about forty times more documents than the two others, more specific peer reviewed scientific literature databases. Despite this difference, the three databases produce similar chronologic and thematic trends, although with a more societal challenge dimension for Google Scholar. Analysis of the terms 'UNESCO Global Geopark' (UGG), 'Geopark' and 'Geoheritage', reveals a rising number of publications since 2016. However, this increase is mostly related to Asian countries, while Europe is only a modest but slow and regular increase contributor. Geosciences are the main research categories conducted in the geopark context, as already demonstrated by Ibanez and co-authors is a recent paper of 2019. The research is mainly performed by academics in universities and published in geoheritage, environmental and geosciences journals. Social sciences and humanities (~20%) and management (2%) are also part of the research performed in these areas. Geotourism, despite a high number of publications, gives only few results and is probably included in the social sciences. Contrary to a general perception, 'Geoconservation' and 'Geosite' seem to be less frequent keywords in the geopark context or possibly less research is done on these topics. This is also the case for mining and resources (except water). The karst environment is the most cited geo-environment associated with 'Geoheritage' and 'Geopark'.

In Belgium geoheritage research is mainly performed by universities and federal research institutes. Several geosciences and geosciences research funding associations exist. Based on the literature study, the UGG guidelines and the composition of existing committees, we propose possible representatives in the Belgian Geopark committee. The involvement of scientists should guarantee quality and politically neutral positions, the national geopark committee should guarantee the preservation of geoheritage while promoting new UGGs. The involvement of financing and funding leverage in organizations may strengthen the support to forthcoming geoparks.

TRACES OF HOMO ERECTUS OF EARLY PLEISTOCENE IN KULA-SALIHLI ASPIRING GEOPARK, WESTERN ANATOLIA?

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Keywords: Mediterranean, Anatolia, Western Turkey, Hominin occupation, River Terraces.

The Anatolian peninsula, bounded by the Black Sea to the north, the Aegean Sea to the west, and the Mediterranean Sea to the south, forms the western limit of Asia and, albeit still within modern Turkey, shares a border with European Eastern Thrace to the west. Anatolia lies at the gateway from Asia into Europe and has frequently been favoured as a route for Early Pleistocene hominin dispersal. Although early hominins are known to have occupied Turkey, with numerous finds of Lower Palaeolithic artefacts documented, the chronology of their dispersal has little reliable stratigraphical or geochronological constraint, sites are rare, and the region's hominin history remains poorly understood as a result. Here, we present a Palaeolithic artefact, a hard-hammer flake, from fluvial sediments associated with the Early Pleistocene Gediz River within the territory of Kula-Salihli Aspiring Geopark, Western Turkey. This previously documented buried river terrace sequence provides a clear stratigraphical context for the find and affords opportunities for independent age estimation using the numerous basaltic lava flows that emanated from nearby volcanic necks and aperiodically encroached onto the contemporary valley floors. New 40Ar/39Ar age estimates from these flows are reported here which, together with palaeomagnetic measurements, allow a tightly-constrained chronology for the artefact-bearing sediments to be established. These results suggest that hominin occupation of the valley occurred within a time period spanning ~1.24 Ma to ~1.17 Ma, making this the earliest, securely-dated, record of hominin occupation in Anatolia.

GEODIVERSITY AND ABIOTIC ECOSYSTEM SERVICES

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Keywords: memory of the Earth, geodiversity, sustainable development.

The International Geoscience and Geoparks Programme approved in 2015 by the 38th session of the UNESCO General Conference, introduced the UNESCO Global Geoparks (UGG) as the new UNESCO site designation for areas with geological heritage of international values. A bottom-up holistic approach is applied by UGGs within areas of rich geodiversity and geoheritage, which aim to support local communities in promoting awareness on climate change issues and geo-hazards phenomena. A trans-disciplinary holistic approach has been developed by a PhD project within the "Tech4culture" program- H2020 Marie Curie Fellowship. The research objective is to define a methodology for the measurement of geodiversity based on the twenty- five "ecosystem services" defined by Gray. (2013). The research has been running from last January and the applied methodology focused on an iterative process which has been developed through the following main steps:

1) Analysis of the geological heritage, geosite classification and management in the two cases study Magma and Sesia Val Grande UNESCO Global Geopark.
2) Learning of the ISPRA (Italy) and at the Geological Survey of Norway methodologies and criteria for the geosites's description and registration.
3) Selection of four geosites in each of the pilot areas, selection of the best categories for their: "registration", and "evaluation". The purpose is to apply the chosen categories for the setting up of a data base for the two territories and to develop tailored management tools based on that database.
4) After the selection, the selected criteria have been applied to the eight geosites.

The results are, so far, the assessment of the agreed and tested categories for the geosite classification in a database, which can be exploited to others UNESCO Global Geopark.

Next step will be to analyze and to adapt the value framework for Geodiversity defined in the report: "The social and economic value of the UK's geodiversity" and its subcategories, to our two cases study.

RAISING AWARENESS ABOUT OUR GEOLOGICAL HERITAGE THROUGH COOPERATION

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Keywords: Cooperation, outreach, education.

Katla UNESCO Global Geopark is situated in South-Iceland. The Geopark is about 9% of the country, covering an area of 9542 km^2. It reaches from the highlands where glaciers cover the central volcanoes and extends to the coastline where vast, sandurflood plains have formed in the last thousands of years due to repeated explosive, glacio-volcanic eruptions causing ashfall and glacier outburst flooding from the central volcanoes of the Geopark. Katla Geopark has only 3000 inhabitants although spread over such a huge area of land. This part of Iceland was once one of the most isolated due to difficult crossing of glacier fluvial rivers, which constantly change paths in reflection to eruptions, climate, seasonal variations, etc. One of our main goals in Katla Geopark is to raise awareness and understanding of our geological heritage - the geological forces that have formed the land and the resilient people due to the repeated catastrophic eruptions in Katla Geopark, Iceland´s most volcanically active area. Understanding the past is the key to predicting the future.

On October 12th, 2018, exactly 100 years ago, a huge eruption occurred in one of Iceland´s and Katla Geopark´s most dangerous volcano, Katla. In commemorating this catastrophic event, Katla Geopark hosted the largest event the Geopark has ever been part of. The event took place in the heart of Katla Geopark in the town of Vík, (approximately 650 inhabitants). Katla Geopark was one of the leading planners alongside a few, larger governmental institutions. This event was open to everyone and was also free of charge. The conference was well attended with people travelling from all over Iceland and some came from abroad even! There were over 400 members who took part in the conference. Over 20 lecturers from various institutions and organizations educated the audience of topics related to Katla Volcano and the eruption in 1918. Members of the geological hazard group from the Met Office and Earth Science department of University of Iceland introduced their monitoring equipment, volunteers from the National Rescue Squad based in Vík displayed their vehicles and equipment for rescue missions. Two field trips were planned and well attended on the second day to the area and a special education course/game was planned for our 3 Geo-schools. A magazine with abstracts from the lecturers was given everyone who attended as well aspublished online. The conference was streamed live with thousands of viewers! The conference gained great coverage in the news.

This was a great co-operational event and Katla Geopark is proud to have been a part of it and gained high national recognition and has opened various opportunities for future cooperation and projects including Katla Geopark. It was also a true opportunity for the Geopark to be the bridge between science and the community – a great platform to raise awareness on a large, national scale!

AN AREA OF INTERNATIONAL SIGNIFICANCE FOR GEO-CONSERVATION IN THE WESTERN ANATOLIA: THE KULA-SALIHLI ASPIRING GEOPARK, WESTERN TURKEY

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Keywords: Turkey, Western Anatolia, Geoheritage, Geoconservation, Kula-Salihli Aspiring Geopark.

The Kula-Salihli Aspiring Geopark is located in the central part of the Gediz graben in the Aegean Region is in the western part of the Inner West Anatolian Plateau. This area constitutes one of the most tectonically active regions and also is the youngest volcanic field in Turkey. The geopark area has a very complex structure in terms of its geology and tectonics, as a result of which, the area shows very diverse landforms. From a tectonic and geological point of view, the area has a very complex geological history. The geopark contains evidence from more than 200 million years of Earth's history, from the Paleozoic metamorphic rocks to prehistoric volcanic eruptions, and in this respect it is home to a very rich geodiversity. With all this richness, the area is a field laboratory in terms of the Earth sciences. It hosts various types of fault structures, examples of fluvial, volcanic and karstic landforms, evidence of erosional processes, examples of topographic inversions due to differential erosion processes and rocks and strata formed in different geological periods. This area has gained its general geomorphological appearance as a result of tectonics, volcanism, climate changes and the establishment of the Gediz River drainage system on the area.

Besides its importance in terms of Earth sciences the Kula-Salihli Aspiring Geopark, where a tool belonging to an early Pleistocene hominin was recently discovered, also constitutes one of the rare areas of Turkey in terms of historical, cultural and archaeological significance. Therefore, this area has been the home of human activity from prehistoric times to today and there is a rich heritage from Prehistoric, Lydian, Roman and Ottoman periods. The aim of this study is to introduce international importance of the Kula Salihli Aspiring Geopark in terms of earth-sciences, historical, cultural and archaeological values.

NEW TOOLS IN GEODIVERSITY MANAGEMENT: PYROCLASTIC FLOW MAPPING IN LESVOS ISLAND

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Keywords: Petrified Forrest, Geodiversity, Pyroclastic flows, Paleogeography, GIS.

The term ‘geodiversity’ was first used in 1993 as the geological equivalent of biodiversity. In this work it is presented a new methodology which can be used in better understanding, interpretation and management of geodiversity in Lesvos island UNESCO Global Geopark, Greece. More specifically, it is presented the preliminary results of an effort to use the 3D mapping of fossils tree trunks in Akrocheiras fossil site of the Lesvos Petrified Forest, in order to understand the directions of the pyroclastic flows that created this fossil site. The Lesvos Petrified Forest, is a protected natural monument, created due to the intense volcanic activity in Northeast Aegean area, during lower Miocene, The horizontal fossilized logs were mapped in order to determine the direction of the pyroclastic flows that moved them in the wider area of the Lesvos petrified forest. To achieve these measurements were made in the field as well as an analysis of orthophotomaps. The results represented an area of ~80 hectares, and they show a pattern that can be used to determine the regions of paleogeography.

VALUING URBAN GEODIVERSITY THROUGH STORIES CARVED IN THE ROCKS

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Keywords: Aspiring Geopark, Urban geodiversity, Education, Tourism.

The observation of the rocks used in the construction of the façades of buildings, monuments and pavements of a city is a simple and pleasant way to enter the world of Geology.

To give life to this rocks and to the fossils included, we published, in 2019, a book profusely illustrated containing a set of "Stories carved in the rocks" which constitues a field guide of discovering rocks and fossils in Loulé - a town located in the Algarve (Southern Portugal). We wrote this guide with the enthusiasm resulting from the interest that the learning of Geology, in an urban environment, awakens both in geologists and in palaeontologists, in teachers and students, as well in non-specialists. With the help of this guide, you can tour through Loulé and discover rocks and fossils, millions of years old, which have wonderful stories to tell. One thing is certain, whoever reads this book will never look at the rocks the same way. This book, has now a resource that values and promotes the educational and also the touristic values of its urban geodiversity.

This book constitues an exemple of valuation of the heritage in the territory of the Aspiring Algarvensis UNESCO Global Geopark which envolves the counties of Loulé, Silves and Albufeira (Algarve, Southern Portugal). In the future this good practice will be extended to other towns of the territory of the future Algarvensis Geopark.

COLLABORATION IN GEOCONSERVATION BETWEEN YANQING UGGp AND LESVOS UGGp

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Keywords: Geoconservation, Geoprotection, Dinosaur footprint, Petrified trees.

Geopark is a unified territory with internationally significant geoheritage, rich natural resources, spectacular cultural relics and promising land with the obligations of geoconservation and protection, promoting Earth Sciences and sustaining local community, which is guided by UNESCO with the intercourse and communication under the framework of Global Geopark Network (GGN).

Yanqing UNESCO Global Geopark is located in Yanqing District, at northwest Beijing with four Scenic Areas: Longqingxia Area, Guyanjia Area, Badaling Area and Qianjiadian Area, occupying an area of 620.38 km^2 and comprising numerous geological sites as petrified trees, dinosaur footprints, north China karst, granite landforms and so on and precious cultural relics as Badaling Great Wall and Guyaju (Ancient Cliff Residence), which was accepted by GGN in 2013 as a Global geopark. Since then, the geoheritage and geosites in Yanqing UGGp received strong protection in both legislation and practice. Nevertheless, an appropriate method for conservation of the geoheritage as petrified trees and dinosaur footprints was not implemented till the collaboration with Lesvos UGGp. As one of the founders of EGN and GGN, Lesvos UGGp has a long history of geoconservation with abundant experiences since the establishment of Natural History Museum of Lesvos Petrified Forest in 1995.

This paper urges to relate the collaboration between Yanqing UGGp and Lesvos UGGp and present the process of conservation in Yanqing. The joint project, advanced techniques of geoconservation, was introduced and implemented in Yanqing.

THE ESTRELA GEOPARK'S GEOHERITAGE AND ITS VALORISATION

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Keywords: Estrela Geopark, Geological Heritage, Glaciation, UNESCO, Valorisation.

The Estrela Aspiring Geopark, with its more than 2200 km^2, is a territory made of a remarkable geological heritage that tells a story that began more than 650 Ma ago and extends to the present day. The main singularity of this Geopark is a result of the evidences left by the last glaciation, that had its maximum in serra da Estrela about 30 thousand years ago. Nowadays, these evidences associated with ancient glaciers make Estrela one of the most important places in Southern Europe for the study of glaciations, with high pedagogical, scenic and a remarkable scientific values. In fact, the geological and geomorphological elements of this territory make Estrela a living laboratory with enormous potential for the promotion of knowledge and learning.

In this perspective, the valorisation of Heritage is perhaps one of the most relevant missions of a Geopark, based on strategies that encompass different levels of action, whether in the context of Science, Education, Culture, Tourism and, inevitably, the Communication itself. The Geological Heritage should be valued and used as a platform to accomplish the different objectives for Sustainable Development defined by UNESCO, focusing on a strategy that ensures networking, community involvement, strengthening of the promotion of science, development of active strategies for formal and non-formal education, training of new tourism approaches and strong and effective territorial communication.

Thus, based on this valorisation, there are several initiatives under way that can be mentioned: the implementation of interpretive structures, which aim at fostering knowledge about the various geosites, always focusing on a holistic approach; the promotion of the Estrela Geopark Interpretation Centre, which allows a new tourist experience for all visitors of the highest point of Continental Portugal; the creation of strategies focused on nature and health tourism, which has shown itself to be a branch with increasing growth; the commitment to education and educational programs, with the aim of strengthening formal learning, but also educating and encouraging students to adopt a healthy lifestyle; the communication and promotion of heritage in an accessible way that contributes to the resident populations sense of belonging.

Underrated for a long time, Geological Heritage is at the moment the basis for an important development strategy, unparalleled in this territory, and born of the awareness of the scientific value of its geology and the history it contains. In this sense, this communication intends to demonstrate how the Estrela Geopark values its geological heritage and, through it, manages to create mechanisms for the preservation and creation of added value for its Communities, for whom this UNESCO classification is intended.

GEOCONSERVATION: GOOD PRACTICES IN SOBRARBE-PIRINEOS UNESCO GLOBAL GEOPARK

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Keywords: geoconservation, mountains, outreach, research, Sobrarbe-Pirineos.

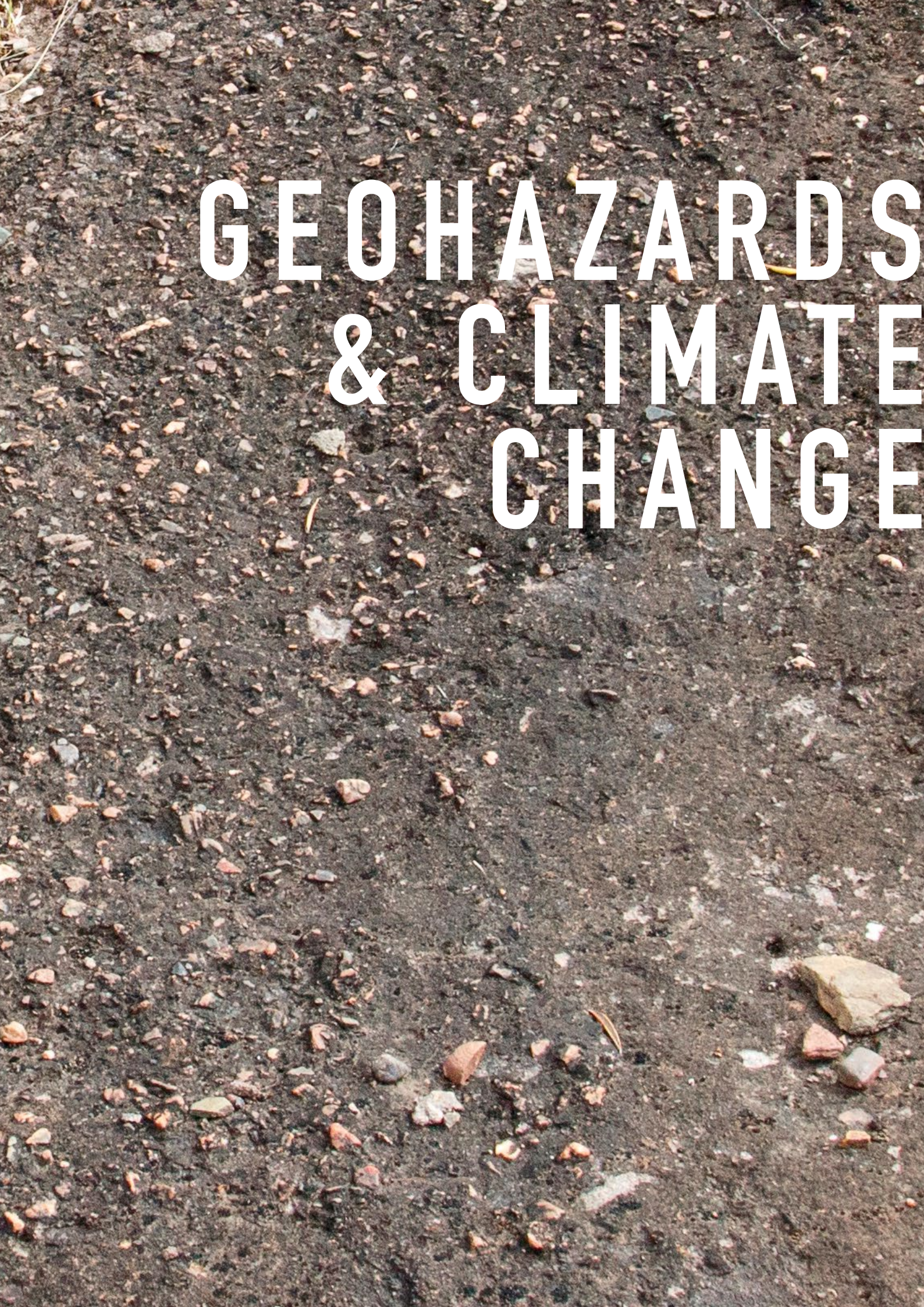
Each time, more and more people are accessing mountain environments. These areas receive around 20% of global tourism, who not always is aware about the geological features that make up the landscape. The poor knowledge about the vulnerability of the geological part of nature make conservation efforts be focused mainly on protecting only the living beings. The term geoconservation itself remain quite unknown for the general public.

Some mountains are also areas of high geological interest for researchers. Thus, large amounts of geologists and universities move yearly to these environments and many key outcrops are intensely used.

In the heart of the Pyrenees, Sobrarbe-Pirineos UGGp receives yearly these two kinds of visitors. Thousands of tourists are attracted by some of the most famous landscapes of this mountain range and go all over places like Ordesa and Monte Perdido National Park, Chistau and Bielsa valleys or Sierra de Guara. In adittion, several universities, research centers and oil companies have chosen Sobrarbe-Pirineos as a place to generate knowledge since many decades ago.

To prevent the damage of sites with geological value and to raise the awareness about geoconservation, the Geopark has launched two leaflets suggesting good practices. One of them is addressed to tourists and mountaineers. Fossils, stone cairns, stalagmites and stalactites, shortcuts, graffitis and mines are the topics about the suggestions are given. The second one, for researchers and teachers, deal with the fieldwork, sampling, paleomagnetism coring, caves, fossils and protected areas. In a more detailed way, advices for developing the fieldwork minimizing the impact are explained.

Through the making of these materials and the corresponding diffusion, the Geopark plays an important role protecting the geological environment and communicating a more realistic understanding of mountain areas, that includes the geological features as a landscape key element.


GEOHAZARDS
& CLIMATE
CHANGE

AFTER GEOHAZARD IN CAOLING: OPULENCE AND THE URGE FOR A GEOPARK

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Keywords: Geohazard Community participation Opulence of geopark.

On September 21, 1999, the strongest earthquake of the century hit central Taiwan. The earthquake measuring 7.3 on the Richter scale shook Taiwan, causing severe damage in Caoling village where immediately slipped 120 million cubic meters of debris. After this geological event, under the efforts of the community, Caoling was established in 2004 as the first aspiring geopark in Taiwan. The urge for a geopark attempts to develop new jobs and create new opportunities by landscape conservation and management of geo-heritage, provision of geo-tourism services and geo-education. In over twenty years after geohazard, Caoling actively participates with the Taiwanese Geopark Network and obtains concrete results heading to be an officially designated geopark, since on July 27, 2016, the government incorporated Geopark into the Cultural Heritage Preservation Act. This paper provides the inside of how changing the power of landscape of geohazard into opulence of its geo-diversity and geo-heritage with Caoling Geopark empirical experience. After the inventory of the various resources, Caoling Geopark is therefore developed with ten geo-sites, including (1) Feishan Landscape Terrace, (2) Shuiyudong Waterfall-Frog Stone, (3) Cliff Wind, (4) Chingxi Trial, (5) Penglai Waterfall (6) Shibi Valley - Youlong Lake – Lianxin Cauldron, (7) Yunling Hill, (8) Concentric Waterfall – Lianzhu Cauldron, (9) Wannian Canyon and (10) Caoling Fossil. These geo-sites function in highly complex social and ecological environments, which are culturally embedded, value-driven, economically interest-led and politically biased. Caoling Geopark constructs of geohazard resources as valuable areas can, in this case, lead to the protection and preservation by initiatives of collective action. In this sense, local community can be an agency subjectively as well as positively to promote its way of development for changing landscape of power.

CLIMATE CHANGE, ENVIRONMENTAL DEGRADATION AND MASS EXTINCTION: EVENTS IN THE EXISTENCE OF A HABITABLE PLANET

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Keywords: climate change, environment, mass extinction.

The ~4.5 billion year geological record reveals a history of global climate change, mass extinctions, shifting continents and changing atmospheres. Increasing oxygen levels coincided with the appearance of single and multicellular plants and animals between ~ 2.5 billion years to 541 million years (Ma). From 541 Ma to the present day (Phanerozoic) three major ice ages are attributed to changing atmospheric CO2 concentrations linked to plate tectonic processes and/or the formation of Large Igneous Provinces (LIPs). Ancient air bubbles trapped in ice show that over a period of 800,000 years CO2 levels fluctuated between ~200 parts per million (ppm) during ice ages and ~280 ppm during warmer interglacial periods. Currently, at 415 ppm the atmospheric concentration of CO2 matches values estimated for the middle Pliocene Epoch between 3 – 5 Ma when temperatures were 2˚ – 3˚ C higher and sea level was 15 – 25 metres higher than today. The Phanerozoic fossil record is punctuated by five mass extinctions. The end-Cretaceous (65 Ma) extinction is associated with an asteroid impact. CO2 emissions associated with LIPs events may have contributed to the end Ordovician, Devonian, Permian and Triassic mass extinctions. Postulated environmental effects include climate change, ocean acidification and marine anoxia. Currently ecosystems and biodiversity are affected by rising global surface temperatures, ocean acidification, melting ice sheets and rising sea levels. The causes for changing CO2 levels between glacial and interglacial cycles is not completely understood. However, the current rise in CO2 concentration is consistent with burning fossil-fuels. Per capita CO2 emissions, leading to global warming, correlate positively with the growing per capita global gross domestic product while the demand for domestic consumption has significantly altered 75% of the terrestrial and 66% of the marine environments. The negative human impact on climate and the environment heralds a sixth massive extinction with the predicted loss of approximately one million of the world's 8.7 million plant and animal species. In 2018 the Intergovernmental Panel on Climate Change determined that preventing catastrophic warming and its impact on ecosystems requires limiting the rise in global temperature to 1.5˚C. This involves a 45% reduction in the 2010 levels of CO2 emissions by 2030 and by offsetting all anthropogenic CO2 by 2050. Large scale geo-engineering techniques would be required if warming exceeded 1.5˚ C. The rapid and extensive changes in agriculture, energy supply, industry, transport, buildings and cities by limiting warming to 1.5˚ creates challenges nationally and internationally for governments and businesses. The Paris Agreement, city and community carbon neutral strategies, the growth of ethical investment, and the climate strikes by schoolchildren are examples of actions in response to climate change. UNESCO Global Geoparks can contribute significantly to the vision of achieving climate neutrality by raising awareness of climate change and environmental degradation through educational programmes and by reconciling geotourism and sustainable development by progressing and monitoring initiatives that address their carbon and ecological footprints.

ASPIRING SALPAUSSELKÄ GEOPARK: TOWARDS SUSTAINABLE WATER MANAGEMENT

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Keywords: lake restoration, water quality, Salpausselkä, research, geological heritage.

The aspiring Salpausselkä Geopark covers the city of Lahti and the surrounding region in southern Finland. Salpausselkä ice-marginal formations, their feeder eskers and hundreds of lakes including the southern part of Päijänne, Finland's second largest lake, are dominant features in the area. The unique geological heritage of the area provides the water supply for about 25 % of the population of Finland: the drinking water of the capital area comes from southern Lake Päijänne via a 120-km long rock tunnel, and the inhabitants of the geopark area drink groundwater. The most important aquifers are the Salpausselkä formations and eskers formed by meltwaters of the continental ice sheet. The formation of the lakes of the area was the result of fractures in the ancient bedrock and glacial activity. For example, Lake Vesijärvi was dammed off between the Salpausselkä ice-marginal formations soon after the Ice Age about 11,000 years ago. A great part of incoming water into the lakes is cold and clean groundwater seeping through the thick layers of soil. However, different human impacts like wastewater, agriculture and forestry have a major influence on water quality. Thus, many lakes in the area are not in the good ecological state defined by EU Water Framework Directive, and effective water protection methods are needed.

Lake Vesijärvi was one of the most contaminated lakes of Finland in the 1970s due to heavy external load. Today the lake is an internationally recognised example of successful lake restoration, thanks to determined efforts to save it. The state of the lake began to improve when the discharge of wastewater into the lake was stopped in the late 1970s, but a few years later massive cyanobacterial blooms occurred. Addressing the problem required a new research-based approach, including biomanipulation by removing hundreds of tons of coarse fish annually. Intensive stocking of pike-perch was carried out and its spawning areas were greatly improved, increasing the natural stocks of predatory fish. Other activities include external phosphorus load reduction and oxygenation of the lake, as well as intensive monitoring of water quality and biota. The recreational values of Lake Vesijärvi were restored, and it was again possible to swim in clean water.

The wide social significance of lake and river restoration has been understood, and their state is continuously being improved. The latest innovations include a comprehensive system for urban stormwater management in the city of Lahti to mitigate climate change effects, and a globally novel restoration method that removes nutrients accumulated in the sediments of a eutrophic lake to be used for soil improvement. These restoration methods are interesting examples of what local authorities, universities, researchers, private enterprises and citizens can achieve by working together.

GEOLOGICAL RISKS AND CLIMATIC CHANGE IN KATLA UNESCO GLOBAL GEOPARK

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Keywords: Climatic change, Geological risk, Rockslide.

It is well known that geological risks are inherent in nature at Katla UNESCO Global Geopark in Iceland. The Mid-Atlantic ocean ridge is mostly located along the sea floor, but in Iceland it is visible on land, particularly so in Iceland´s other geopark, i.e. Reykjanes UNESCO Global Geopark. Plate tectonics play an important part in Iceland as the Eurasian and North American plates are moving apart from each other across the country, causing active earthquake activity as well as volcanic eruptions. But there is another important geological phenomenon that has been shaping Iceland and that it is the mantle plume which is presently located near the northeast corner of Katla UGGp. This combination of natural forces has meant that during the last 20 Ma the Icelandic rift zones have migrated stepwise eastwards to keep their positions near the surface expression of the mantle plume, leading to a complicated and changing pattern of rift zones and transform fault zones. Another geographical fact of Iceland is that the prevailing weather includes low pressure systems moving across the Atlantic and across the island from south to north resulting in very high precipitation along the southern shore leading to the formation of icecaps on the mountains that in Katla UNESCO Global Geopark happen to be active volcanoes. Volcanic eruptions in Katla Geopark therefore often include huge floods resulting from ice melting during the eruptions (jökulhlaup) plus at times enormous ash clouds resulting from the explosive phenomena when ice and water meets the hot magma. Historically, it is not only the glacial eruptions that have caused the greatest calamities. In 1783-84 the Laki fissure eruption not only produced enormous lava flows, over 500 km2 and about 15 km3, but also released enormous amounts of sulfur-rich gases into the atmosphere, the effects of the eruption reached far and the sulfuric aerosol cloud produced by Laki generated a persistent haze (dry fog) that hovered over large part of the northern hemisphere during the summer of 1783. But climate change poses new and additional geological risks in Iceland while all the above-mentioned phenomena is still a force that is to be reckoned with. It is well known that the volcanic activity in Iceland increased enormously in early Holocene, it has been estimated to have been about 30 times bigger than at present. According to recent estimates practically all of our icecaps and glaciers will have disappeared within the next two centuries leading to greater volcanic activity. During the last couple of years another geological risk has been identified, i.e. unstable mountain sides following the retreat of glacier tongues. On one hand this has been a part of the geological story in Iceland since the start of the Holocene, but the sudden retreat of glacial tongues following the present climate change is creating new immediate risks. The presentation at the conference will focus on these new developments in Katla UGGp and neighboring areas.

WILDFIRE RISK ASSESSMENT FOR ESTRELA GEOPARK, PORTUGAL: A KNOWLEDGE BASIS FOR THE ADAPTATION TO CLIMATE CHANGE

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Keywords: Climate Change, wildfire, mountain.

Mediterranean landscape is historically linked with wildfires, which have always played a crucial role in biomass control and nutrient cycling for the ecosystem. However, since human settling and development of agriculture, anthropogenic factors have become the main drivers of wildfire occurrence. In the last decades, due to harsher weather conditions and changes in human activities, wildfire impacts have raised in extent and severity. Wildfires are currently the most important natural hazard in mainland Portugal; and the Central region, due to its Mediterranean weather influence, the most affected by fires during dry seasons.

Estrela Geopark is a territory located in the Central region of Portugal, comprising Serra da Estrela mountain range and the surrounding population of more than 150,000 people with historical connections to this mountain. In recent years, it has been one of the most visited destinations in inland Portugal, supported mostly by its scenic and cultural values.

The territory contains numerous geosites concerning important evidences of the last ice age among other aspects, which make it eligible for a UNESCO Global Geopark designation, an application currently ongoing. Additionally, three major national rivers of Portugal have their headsprings in Serra da Estrela, including the Zêzere river, which supplies 60% of all the water consumed in the Lisbon region. Its montane ecosystem, acting as a refuge for endemic and endangered species, is acknowledged as a Biogenetic Reserve (Council of Europe), Site of Community Interest (European Union), and Wetland of International Importance (RAMSAR Convention), and as such, it is extremely vulnerable to climate changes and requires great attention.

This entire heritage is constantly threatened by wildfires year after year. Furthermore, it is well-known that high-altitude environments, due to high wind and low moisture, are more prone to fire propagation. The year 2017 held the worst records in fire occurrence and lives lost in the Portuguese history and 23% of Estrela Geopark area burned.

This region is acknowledged by a long-lasting tradition in shepherding activities, despite these been neglected by younger generations. This duality is suspected to have outstanding influence in wildfire occurrence in the region, because it puts together uncultivated lands with great fuel accumulation with elderly population using traditional fire-based techniques in land-clearing for agro-pastoral activities.

Along with the above mentioned, several other physical and anthropogenic predictors proposed in previous research on wildfire occurrence in the Mediterranean region were considered in a Geographically Weighted Logistic Regression, in order to assess local main drivers for wildfire occurrence throughout Estrela Geopark territory. The outcome map of this analysis indicates the local factors in which a slight effort of attenuation would lead to better results on the structural wildfire risk. This provides directions for the implementation of straightforward actions to prevent wildfire impacts in the territory, as a clear strategy for its adaptation to Climate Change scenarios.

THE EUROPEAN GREEN CAPITAL FOR 2021 IN THE ASPIRING SALPAUSSELKÄ GEOPARK IN FINLAND

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Keywords: European Green Capital, Aspiring Geopark, networking

The Finnish city of Lahti has been chosen for the European Commission´s European Green Capital Award for 2021. Lahti is also the centre and main city of the aspiring Salpausselkä Global Geopark. Many of the properties that helped it to become a Green Capital are very relevant to the geopark status, also. The European Green Capital 2021 title brings a lot of responsibility to be a strong role model for cities across Europe. Also UNESCO Global Geoparks have a large responsibility to network, to spread information and to act as examples of good practice to other regions in Europe and beyond.

The European Green Capital title has been awarded since 2010; making Lahti the twelfth winner. It is intended for cities with over 100,000 inhabitants that have made substantial efforts to improve their environmental performances.

In order to be considered for the European Green Capital award a city must prove itself under twelve different categories, or indicators of environmental performance. These categories are all significant aspects of sustainable development and a good balanced overall performance that is required. These indicators are: climate change mitigation, climate change adaptation, sustainable urban mobility, sustainable land use, nature and biodiversity, air quality, noise, waste, water, green growth and eco-innovation, energy performance and governance. The majority of these same categories are also key features required in order to obtain and maintain UNESCO Global Geopark status. It is in fact no coincidence that they also very much overlap with the UNESCO Sustainable Development goals.

Lahti is particularly strong in the fields of air quality, waste, green growth and eco-innovation and governance. In Lahti, 99 % of people live within 300 metres of green urban areas. It is under one kilometre from the city centre to the impressive Salpausselkä Geopark marginal formations and kettle hole area. From inside these kettles the visitor can enjoy the silence of the natural world. The undulating landscape also offers abundant sporting opportunities; the area is internationally known for winter sports, where the Nordic World Ski Championships have been held several times.

Lahti is also known internationally for successful natural waterway protection and restoration. Lake Vesijärvi was badly polluted in the 1970s, smelling badly and unsuitable for swimming in. Due to cooperation between the municipality, research institutions, enterprises and above all the citizens the lake is now an excellent recreational location from which residents and visitors alike can greatly benefit.

A European Green Capital, with a strong contribution to being awarded the title coming from the natural world, can also form the basis for a future UNESCO Global Geopark. The human factor also enters strongly into both designations, both in terms of opportunities for enterprises with relevant activities, and in how citizens are committed to preserving and promoting the strengths of their local city and region.

POSTER´S COMMUNICATIONS

GEOPARK FIELD GUIDEBOKS: AN INDISPENSABLE TOOL FOR WELL-INFORMED AND RESPONSIBLE TOURISM

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Keywords: geotourism; education; science outreach; Comarca Minera, Hidalgo; Maestrazgo.

It is undoubtedly true that we are immersed in a digital world where successive versions 3.0, 4.0, 5.0… follow each other in extremely rapid succession. Nevertheless, the most outstanding geoheritage commonly is kept in remote and pristine areas, which lack modern communication infrastructure as we know it in urban areas. This affects particularly to the Internet telecommunications network, which not necessarily covers relevant geosites or large areas of many UNESCO Global Geoparks (UGGp). In this particular context, printed field guidebooks became invaluable, with usefulness but different functions depending on the time of use:

1. **Before visiting a geopark**: guidebook assists in planning the excursion, seeking efficiency in terms of selecting the sites to be visited, according to specific interests, available time and so on (if available, digital information is equally useful during this stage).
2. **During field excursions**: guidebook is essential in the non-guided visits, being the principal information source that even contributes to the safety of the visitor. On the other hand, Internet signal coverage, data availability and battery duration are limiting factors for using digital information.
3. **After field excursions**: guidebook remains as a memory that could be preserved *forever* in a library, in contrast to ephemeral digital files. Moreover, the *fetish* appreciation of printed books —that seems to increase as the digital world expands— could be a factor that favours the sale of guidebooks and thus the geopark income.

In this contribution, we analyze and compare two contrasting geopark guidebooks (both written in Spanish): (*a*) "*Guía de Campo del Geoparque de la Comarca Minera*" (UGGp, founding member of the Latin America and Caribbean Geoparks Network), from Hidalgo state, Mexico, and (*b*) "*Guía turística del Geoparque del Maestrazgo*" (founding member of the European Geoparks Network), from Aragón, Spain.

In both guides, the first section contains a general explanation about UGG. The Mexican one is a rather large book (16×21 cm; 243 p.) focused to the geological knowledge and exceptional richness of the geopark; a final section of 75 pages is devoted to geosites and has a practical approach. The Spanish guide is very portable due to its size (11 cm in width; 129 p.) —it fits in a pocket—, and deals mainly with geosites, which are categorized based on its principal value and/or designation: Natural Monument; Good of Cultural Interest; Natura 2000 network…

While the main goal of both guides is the same —promoting the visit of the geopark in a formative, pleasing and respectful way—, they followed rather different strategies that in part obey to the different social, economic and environmental conditions between Mexico and Spain. A long-term beneficial effect of both guides to their respective geoparks is that they give added value to the territories and their natural features, which became sustainable natural resources and contributed to redistribution of wealth and to spread environmental awareness.

DINOSAUR ON-SITE MUSEUMS AS USEFUL TOOLS TO FOSTER GEOTOURISM

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Keywords: sustainable development, geoturism, Zigong, Teruel, *in situ* fossils.

Dinosaurs awaken interest and attraction in all types of audiences. The museums that exhibit fossils of these animals are very popular in the main cities in the world: Beijing, New York, London, Buenos Aires... cities that do not normally need additional attractions to promote the visit, given their great historical, cultural, recreational, and scientific offers. However, dinosaurs are a formidable resource to favour geotourism to cities or regions that do not have an international attraction as high as those previously mentioned. This happens when the fossils are offered to the visitor exactly in the same place where they were found, through exhibitions that show them on-site. The use of this resource is almost compulsory in the case of dinosaur tracksites that have a large extension, because it is not feasible -neither advisable- to dismantle the layer that contains them in order to be stored in the collections of a museum. In fact, many cases can be documented in which dinosaur ichnites have been used to promote geotourism activities. A much less usual case consists of displaying the skeletal remains of dinosaurs in the same site in which they were found ("site museums"). In this contribution we present two cases of different dimensions but with a common goal: to contribute to the economic development of the region.

While Zigong City in China has some 3.23 million inhabitants and a superb dinosaur site museum, one of the best in the world, which attracted 863,600 visitors in 2018, Teruel Province (less than 150,000 inhabitants), has also opted to promote geotourism from dinosaurs. It should be noted that Teruel was affected by a severe process of depopulation: while in 1910 the census of the province was 265,908 inhabitants, in 2018 the number had been reduced to only 134,490 (35,691 in Teruel city). A relevant project to try to mitigate the depopulation is Dinópolis, a network of palaeontological facilities (192,949 visitors in 2018). In addition some dinosaur sites in Teruel Province have been prepared to be visited.

Among the sites offered to visitors, we can highlight Ababuj tracksite, which includes explanations in Braille language and viewing platforms suitable for people using a wheelchair, and those available in El Castellar under the concept of the so-called DINOwalk. In this village, with only 52 inhabitants, it is especially remarkable the recently launched exhibition of original bones at their original site, for the first time in Spain. There are also new projects in progress in Zigong dealing with the topic.

These two examples of a very different investment and addressed at a truly different number of potential visitors demonstrate that, local or regional economies of very diverse scales, can be revitalized thanks to the exhibition of original bones of dinosaurs at their original locations. As irresistible elements to foster the visit of the huge number of curious individuals who are keen on these ancient creatures and would love to visit those facilities wherever in the world they come from.

GEOPARKS A NEW APPROCH IN LAND USE PLANNING

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Keywords: Sustainable development, Geoparks, land use planning, Iran.

Geoparks are managed areas include geosites as well as natural, social, cultural and historical sites, which embraces three principles namely basic conservation and utilization of land resources, education and sustainable economic development. Three mentioned principles in defining geopark are also considered important approaches in land use planning in Iran. In addition, the plans and objectives considered in geoparks are in accordance with the principles of land use planning.

Developing tourism through geoparks will flourish the rural community by providing new opportunities for many villages and low-income areas and it will lead to the development of these areas and causes stability in these settlements.

Development of sustainable tourism through geoparks will play a crucial role in land use planning in order to eliminate deprivation and achieve spatial justice (proper distribution of infrastructure, services, welfare as well as adequate distribution of income and equal employment opportunities) and finally social justice.

Geopark objectives are in accordance with the principles of land use planning in Iran, which has a reverse relationship with the development and power of each region. In the other words, whatever the region is less economically developed and less productive, implementing such studies and establishing geopark is more reasonable.

Current study is aimed at studying the role of geoparks in land use planning in Iran in which different aspects of geopark, land use planning and their relationship have been completely analyzed. Furthermore, electronic questionnaires were prepared and sent on the role of geoparks in the economic, social and cultural development of local communities and their contribution to geopark, initiatives and innovations used in geoparks aiming at sustainable development of local communities (based on the principles of land use planning), which were prepared as four choice questions and descriptive questions.

Four world geoparks from China, two geoparks from Portugal, a geopark from Indonesia, a geopark from Malaysia, a geopark from the UK, a geopark from Spain, and finally, Qeshm global geopark from the Islamic Republic of Iran answered to the questions.

GEOLOGICAL EXPERIENCE IN KAYAK WITHIN THE SANTOLEA RESERVOIR (MAESTRAZGO GEOPARK AUGGP, SPAIN)

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Keywords: Geotourism, Kayak, Sustainable development, Maestrazgo.

Santolea Reservoir (40°45'22"N; 0°20'0"E) is located in the middle-high Guadalope river course, the backbone of the Maestrazgo aUGGp (founding member of the European Geoparks Network). From a geological point of view it is located within the Aragonese western branch of the Iberian Mountain Range (formed during the Alpine Orogeny) in the confluence with the Coastal-Catalan Chain.

Despite being an anthropogenic environment, the territory has outstanding scenic and natural interest. In fact, it was used to shoot a sequence for the launching of the Kawasaki Z800 superbike promotional video. In addition we note the existence of different rock-shelters included in the World Heritage List of UNESCO since 1998 (*Rock art of the Mediterranean Basin on the Iberian Peninsula*), some Spanish Assets of Cultural Interest (BIC) and the Fonseca Bridge Natural Monument.

Bearing these facts in mind we have created a pilot activity guided by geologists, the First Kayak Route, to discover the unique elements of the landscape of the Maestrazgo aspiring Geopark and understand the formation of its spectacular calcareous reliefs with millions of years of history. The activity tries to combine active and scientific tourism and also adds the experiential factor, without forgetting sustainability and respect of the environment. Furthermore, it aims to pay homage to Santolea, the only village of Teruel abandoned in 1970 due to the construction of the reservoir.

The kayaking tour guided by a geologist around the reservoir includes an introduction to both: the geology and geography of Maestrazgo aspiring Geopark and the kayaking equipment and techniques at the shoreline. Along the route, the discordant contact between the Cenozoic materials (conglomerates and sandstones) and the Cretaceous materials (from the Albian and from the base of the upper Cretaceous) can be clearly observed.

Also the marine sedimentary series of the Upper Cretaceous characteristic of the area, that usually presents abrupt reliefs and vertical walls - where it is possible to identify some geological risks (subsidence) and rocky cliffs - are highlighted. Paleokarst structures are recognized "hanging" and visible on the walls that house populations of vultures (*Gyps fulvus*), Golden Eagle (*Aquila chrysaetos*) and peregrine falcon (*Falco peregrinus*), inside the "*Río Guadalope-Maestrazgo" ZEPA* Special Bird Protection area of the Natura 2000 network.

This experience captured the interest of various media, including the National Spanish TV (TVE), which echoed it on the most viewed edition of its newscast. It was one of the finalist candidates for the best Aragonese Tourist Experience 2018 Award of the Government of Aragon, as well (http://experiencias.turismodearagon.com/tour/geopaseo-kayak-santolea/).

THE VALORATION OF GEODIVERSITY IN SIERRAS SUBBETICAS UNESCO GLOBAL GEOPARK COMPARING THREE-METHODS

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Keywords: *Geodiversity, Geopark, Assessment, Sierras Subbéticas UGGp*

Geodiversity is defined as the variability of abiotic elements, including topography, lithology, tectonic, geomorphology, soil, hydrology, as well as the physical process occurring on the Earth surface and the oceans, besides systems generated owing to natural (endogen and exogen) and human processes, considering the diversity in particles, elements and places. This definition is one of the most holistic because it includes different elements and scales to study and classify Geodiversity. Geodiversity can be assessed by means of very different methods, but all of them may be classified in three main types: qualitative, quantitative, and qualitative-quantitative. This study deals with the comparison of three-qualitative-quantitave methods (Serrano and Ruiz-Flaño; Najwer; and Araujo) to assess the geodiversity in Sierras Subbeticas UNESCO Global Geopark.
The Sierras Subbéticas UGGp is located in the South of Córdoba Province as part of the Andalusian Subbetic Massif. Its area is of 32,560 ha with 8 municipalities. The declaration as UNESCO Global Geopark took place in 2015 owing to its remarkable geological and cultural heritage but, especially, to the richness in fossils (*Ammonites*).

In order to make comparable the three applied methodologies, the geopark territory was divided into a grid of 500x500 m of resolution. Each cell of the grid was characterised according to the variables used by every method (number of lithologies, roughness, water elements, minerals, etc.). The assessment is done qualitatively using two approaches depending on the method: expert criterion; and qualitative classification based on either pre-established parameters or calculations. Each variable used in every method was classified in five levels as well as the final level of geodiversity: very high, high, medium, low, and very low. This made possible to compare the results from the three methodologies.
The results showed very similar results when Serrano and Ruiz-Flaño and Araujo's methodologies were used, coinciding more than 40% of the geopark area as low geodiversity, while Njawer's result was very variable with a maximum value of 30% of the area as high level geodiversity. The differences between them were related to the type of method: both former are quantitative, while the latter is a qualitative-quantitative one introducing the expert criterion. Besides, Najwer introduces an analytical hierarchy process giving more importance to the geological variables respect to others.

To do a good valuation of geodiversity, the method as well as the variables must be selected depending on the geographical characteristics from the area to study. According to this, the most appropriate variables should be selected in order to obtain useful results to improve the land management of Sierras Subbeticas UNESCO Global Geopark.

NEOTECTONICS AND RELIEF REJUVENATION: NEW RESEARCH PERPECTIVES IN NATURAL PARK SIERRA NORTE DE SEVILLA - UNESCO GLOBAL GEOPARK

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Keywords: Neotectonic research, Geomorphic index, Sierra Norte de Sevilla UGGp.

The geological heritage that has been traditionally valued and promoted within the Natural Park Sierra Norte de Sevilla UNESCO Global Geopark is related to the Variscan tectonic evolution, recorded by its Paleozoic and older rocks and its Upper Paleozoic deformation structures.

Nevertheless, the Geopark lies in the foreland of the Betic Chain, which is increasingly becoming the focus of researchers who are interested in alpine intraplate deformation. In this regard, our work inquiries into the relief rejuvenation experienced by areas included in Natural Park Sierra Norte de Sevilla UGGp (Viar Basin), or adjacent to it (Puebla de los Infantes area), potentially related to recent reactivation of previous structures of the Betic Chain foreland. These areas are located in the so-called forebulge, a flexural WSW-ENE relief related to Betic Chain orogenic load, whose southern limit coincides with the sharp topographic escarpment separating the Sierra Norte region and the Guadalquivir basin (i.e. the Betics foreland basin). For such purpose, we have combined structural and geomorphic tools, the latter including both qualitative and quantitative techniques (geomorphic index). Our results associate many of the current relief features observed within our study area with recent tectonic activity (even Quaternary) of faults. These structures can be divided into two groups: a) WSW-ENE normal faults, with a variable lateral component, which are responsible for NNW-SSE relief segmentation of the southernmost foreland; and b) the NW-SE-oriented, Permian-Triassic,Viar Fault, recently reactivated as a left-lateral, reverse fault system, which has produced WSW-ENE relief segmentation (i.e. parallel to the limit between the Sierra Norte region and the Guadalquivir basin. This WSW-ENE segmentation is particularly localized in the current Viar catchment, a NW-SE elongated depression, floored by Permian continental deposits, whose low-lying relief is in topographic continuity with the Neogene marine deposits of the Guadalquivir Basin. The coexistence of both types of structures could be explained by superposition of two different deformation fields: normal faulting would accommodate tangential stretching due to the forebulge bending, whereas the Viar fault would accommodate shortening due to propagation of Alpine recent intraplate deformation.

Concerning the geological heritage of the Sierra Norte de Sevilla UGGp and neighboring areas, these results offer new perspectives that could widen its knowledge and promote future educational and interpretative activities based on the Sierra Norte de Sevilla UGGp landscape features.

THE SCREES OF THE ASPIRING NORMANDY-MAINE GEOPARK APPRECIATION - PRESERVATION - PROMOTION

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Keywords: Aspiring Geopark, lowland scree, Geomorphology, Geoheritage, research.

The Normandy-Maine Geopark region has one of the highest concentrations of lowland screes in the north of France. They can be seen on the slopes of the Appalachian ridge lines made of Armorican sandstone (Ordovician quartzites) which form the Armorican part of the region.

In 2007 the National Inventory of Geological Heritage identified several of these formations from Quaternary periglacial climates which have, on lowland and at these latitudes, an exceptional character. This inventory made us aware of the importance of these screes and the lack of understanding about their formation, their evolution and their current dynamics.

Since 2014, the Normandie-Maine Natural Regional Park has been working towards a better understanding, preservation and enhancement of this heritage. It has carried out several scientific studies on geomorphology, climatology, biodiversity and also on the perceptions and historical uses of these screes. The objective is also to lead some preservation actions (classification, management works) associated with the processes of promotion and data-simplification.

In 2017, in partnership with the University of Poitiers, a geomorphological study was carried out on nineteen screes to establish a typology with the aim of better understanding the formation and evolution of screes. The study also made it possible to identify the different mechanisms of scree-face dynamics by making piles of heterometric rocks, some several meters thick.

This study also helps to better understand the surface condition of the screes, how they disintegrate and their evolution over time. It enables better correlation of the morphological variations of a scree (structure, composition, formation) to the given environment and to the biodiversity. An inventory of lichens and bryophytes conducted on 13 screes, proved the presence of symbiotic species, particularly in the deep cavities of the large-block screes, others on the scree face or on shaded erratic blocks.

This research is done in agreement with the owners of the scree and a summary of the results is given to them. Simplification of the data acquired enables understanding and an awareness by the owners of their heritage.

Its scientific research is essential for actions which preserve and enhance this heritage. It has contributed to the creation of a "Normandy Screes" regional natural reserve in 2018 that will enable the implementation of strong protection measures, awareness improvement, management and enhancement actions.

THE NATURAL REGIONAL GEOLOGICAL RESERVE OF NORMANDY-MAINE: PROTECTION OF GEOHERITAGE AND SCIENTIFIC RESEARCH

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Keywords: Aspiring Geopark, Geoheritage, Geoconservation, Research.

The Aspiring Normandy-Maine geopark region allows us to retrace nearly 600 million years of history through 75 geological heritage sites (National Inventory of Geological Heritage). These sites are often unknown and sometimes threatened by the invasion and/or development of vegetation.

The Normandy-Maine natural regional geological reserve was created at the end of 2009 to protect a set of sites in the Normandy part of the area. Conceived with a multisite logic, it protects a premier site: "La Carrière des Vaux" (Quarry of the Valleys) – home to a very rare Ordovician limestone with a micro-fauna of conodonts.

A natural regional reserve is a national tool providing protection status, thus benefiting from strict regulations (prohibition of sampling unless authorised for scientific purposes).
Its objectives are the protection against anthropic and natural degradations, knowledge improvement, geodiversity as well as biodiversity, its promotion with the general public and the local development. Detailed studies on the Geopark region were carried out mainly in the nineteenth and during the twentieth century. It is therefore essential to increase the knowledge for the development of the scientific classification files.

The valley limestone (Saint-Hilaire-la-Gérard-Orne) has a strong scientific and heritage interest and was the subject of research by the University of Modena (Italy, A.L. Fereti et al). The reserve classification allows for knowledge development (geological study, geophysics), to promote the recognition of this geological legacy (French Paleozoic Group, Universities of Rennes, Brest). It also strengthens the link between geodiversity and biodiversity.

Two other sites will soon be integrated into the reserve:

The "Pierres Plates" (flat stones) site (Bagnoles de l'Orne Normandy, Orne) is a slab of Armorican sandstone (Ordovician) with many ichnofacies: *rusophycus, cruziana, lingula terrier* ...). A geological study (Normandy Geological Heritage Association) brings together knowledge and defines conservation issues and threats. This is a prerequisite for the classification of the site and its protection. Its recognition by the academic world is due to the emergence of an Argentinian academy (University of Cordoba, Argentina)

The sands of Ceaucé (Orne) are associated with Paleogenic fluvial deposits and are located today in a small collapsed dike. A first geological study has brought improved awareness and confirmed its patrimonial importance. University research is necessary for the scientific-based knowledge and help to delineate the perimeter of the site that will be integrated into the natural regional reserve.

The protection of natural and geological heritage requires the implementation of a close link with research for its preservation and enhancement.

CONTINENTAL SALTWORKS OF ANDALUSIA. A RICH GEOLOGICAL AND CULTURAL HERITAGE TO BE RECOVERED

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Keywords: evaporites, groundwater brines, saltworks, geological heritage.

The Campiña Andaluza is a region in southern Spain that extends along 14000 km^2 between the reliefs of the Betic Mountain Range and the alluvial plains of the Guadalquivir River. They are gently hilly lowlands of clayey nature, in which traditional Mediterranean dry-farming crops, such as olive groves, cereals and vineyards, dominate. In the region there are abundant outcrops of Triassic clays with evaporites that, although they have a low permeability, contain brines that originate very low-flow springs. Waters, extremely saline (up to 300 g / L), have particularly high contents of chloride and sodium.

For centuries, these brines supplied to the continental saltworks of Andalusia, unique places for their natural and cultural values. These are small artisanal exploitations that have produced and marketed the salt obtained by evaporating the waters of many hypersaline springs and wells along the Campiña Andaluza. Since the mid-twentieth century there has been a process of abandonment of the interior saltworks (of more than 80 inventoried saltworks, only 10 are active at present), which, if there is no urgent and decisive intervention, will lead to the almost complete loss of this rich heritage.

Despite the high scientific and landscape value (singularity of the springs and their geological context, precipitates of salts, flora and fauna from saline environments) and their association with other natural resources of high ecological value, such as the playa-lakes and the salty streams of the left margin of the Guadalquivir River, the continental saltworks hardly have representation in the Andalusian inventory of geological resources. Only three cases have been cataloged as places of geological interest, two in the province of Córdoba and one in the province of Cádiz.

Finally, in relation to the works of salt exploitation there is a rich ethnographic (evaporation ponds, wells, salt stores) and cultural heritage (historical, archaeological, toponymic, artisanal) that, together with the natural heritage, could facilitate the desirable use of the scientific, didactic and touristic values of these exceptional sites.

COMMUNICATING THE GEOLOGY: "ON THE TRAIL OF THE POLLINO LINE", A GEO-ROUTE THROUGH THE POLLINO UNESCO GLOBAL GEOPARK

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Keywords: communication, geoturism, Pollino UNESCO Global Geopark, geosites.

The Pollino UNESCO Global Geopark is a large area located in the southern Italy at the border of two administrative Regions: Calabria and Basilicata. The park is included in a portion of the axial belt of the southern Apennines featured by different tectonic units deriving from the deformation of the paleogeographic elements of the Tethys ocean and its margins, such as carbonate platform and ophiolite-bearing units. Liguride and Sicilide units, referred respectively to an oceanic domain located to the west of the Campania-Lucania platform or to a transitional domain between ocean and carbonate platform, constitute the backbone of the northern portion of the Geopark, whereas the impressive carbonate ridges of the Pollino and Orsomarso Mts, including the intermontane basins generated by Quaternary block faulting, represent the main features of the southern part.

The whole sector of the Calabria-Basilicata border, indeed, was severely re-arranged by Neogene-Quaternary strike-slip and extensional tectonics, after a significant stage (starting from Tortonian times) of low-angle extension, which led to the exhumation of the non-metamorphic core complex of the chain, constituted of Mesozoic Lagonegro-type pelagic units.

From a geomorphological viewpoint, the neotectonic deformation of the southern Apennines was also responsible for the re-organization and control of many hydrographic networks, and for the displacement of several generations of planation surfaces.

One of the strategic actions put in place by the Pollino Geopark staff has been the realization of a special signage in highly representative sites from both the structural and geomorphological points of view. The geological interpretation and tectonic history of the whole area, such as length, kinematics and seismotectonics of the fault system recognized as the "Pollino Line", has been provided in the Cozzo Vardo and Belvedere di Malvento viewpoints. The selected points of observation offer an eye-catching and almost complete panoramic view of the sites, in terms of landforms, geological structures, and environmental features. In fact from each of this points it is possible to watch the two main mountain ranges included in the area and many other relevant subjects. In this way the Geopark set up a geo-route named "On the trail of Pollino Line", where the tourists can appreciate the information panels installed, explaining the geological, geomorphological, and seismic phenomena that have determined the creation of the present-day landscape.

STRENGHTS FROM MULTI-INTERNATIONALLY DESIGNATED PROTECTED AREAS. THE CABO DE GATA-NIJAR GEOPARK CASE (SPAIN)

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Keywords: Geopark, Conservation, Management, Multidesignation, Andalusia

[1] International recognition of an area is a very powerful tool to raise awareness of its conservation significance from a local or national context into the global arena. In essence, all sites listed under the Ramsar Convention, the World Heritage Convention, The World Network of Biosphere Reserves and the Global Geoparks Network have demonstrated their values for environmental conservation and sustainable development and the importance of international concern for their protection and effective management. Their global recognition is raised to the highest level when several international designations have been given to the same areas of our planet. In this regard, the benefits from increased prestige and visibility as well as donor interest, potential added benefits to local communities and economies, and added attraction for visitors, conservationists and researchers are beyond doubt.
On the other hand, multiple international designations for the same area also bring about some challenges and questions on how to further improve and harmonize the management for such sites.
Andalusia is one of the Spanish regions with the highest number of both Biosphere Reserves (9) and UNESCO Global Geoparks (3). It is also the region where both designations overlap more often, as the Cabo de Gata-Nijar Biosphere Reserve and UNESCO Global Geopark share exactly the same boundaries, while Dehesas de Sierra Morena Biosphere Reserve partially overlaps with Sierra Norte de Sevilla UNESCO Global Geopark

The management of multi-designated protected spaces involves a holistic approach and a different and complex comprehensive management with many stakeholders implied. For the Andalusian competent administration in Protected Areas management (CAGPDS*) the coexistence of multi-internationally designations in the same area, if there is an effective coordination, have the potential to increase resilience to external pressures, underline the exceptional values of the site at a global level, accentuates the scientific significance of the area for research, education and public awareness, facilitate engagement of local communities for sustainable development and can even foster transboundary cooperation.

This model may help develop synergies that eventually result in greater opportunities and strengths for the territory and its inhabitants.

[1] *Managing MIDAs. Harmonising the management of Multi-Internationally Designated Areas: Ramsar Sites, World Heritage sites, Biosphere Reserves and UNESCO Global Geopark.* Thomas Schaaf and Diana Clamote Rodrigues. UICN 2016.

* Consejería de Agricultura, Ganadería, Pesca y Desarrollo Sostenible. Junta de Andalucía.

THE ASPIRING UNESCO GLOBAL GEOPARK MËLLERDALL

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Keywords: aspiring Geopark, Grand-Duchy of Luxembourg, sustainable development, sandstone landscape.

The aspiring UNESCO Global Geopark "Mëllerdall" is situated in Western Europe, in the Eastern part of Luxembourg. Its management structure is a recognized body under national legislation. The park was established in 2016 and includes 11 municipalities with a population of about 25,500. Its overall objective is the sustainable development of the region, which with an area of 256 km² covers about 1/10 of Luxembourg's total area. Guiding themes are the development and promotion of regional products and regional timber, self-sufficiency in drinking water, diversity of landscapes, transfer of knowledge and preservingthe region for all creatures and inhabitants.

The region of the aspiring UGGp Mëllerdall is a rural area. Land use depends on topography and soil types. Plains, plateaus and slopes with fertile soils on a marly substrate are characterized by agriculture (56 %). Meadow orchards are typical elements in this historically developed cultural landscape and are used to produce a variety of regional products. The steep slopes, mainly underlain by dolomites or sandstone, are covered mainly by deciduous and mixed forests (39 %).

Geologically, the proposed Geopark is situated in the centre of the "Trier-Luxembourg Basin", a synclinal structure of Triassic and Lower Jurassic sediments at the north-eastern rim of the Paris Basin. Due to the alternation of relatively thin and only slightly inclined strata of hard and soft rocks, the area forms a small-scaled cuesta landscape. In the centre of the syncline the up to 100 m thick unit of the Luxembourg Sandstone Formation of Lower Liassic age forms one of the most spectacular sandstone landscapes in Western Europe with plateaus separated by deep and narrow valleys. On the rock faces of the Luxembourg Sandstone, an abundance of sedimentary structures can be seen. Geomorphological forms illustrate the vividness of the landscape-forming processes that were active especially during the Cenozoic.

Natural resources like water and building stones have been exploited by man since early times. Archaeological finds show the Mëllerdall to be an important archive for the early history of the Grand-Duchy of Luxembourg. Today, the municipalities are nearly fully self-sufficient in their supply of drinking water. The water emerges from local springs emerge from the important aquifer of the Luxembourg Sandstone, which has a long-term continuous discharge and excellent filtering capacities. The quality as well as the quantity of the water must be guaranteed in the long run, e.g. by the delineation of drinking water protection areas, bringing certain restrictions concerning land use.

The natural and historical heritage of the proposed Geopark is evident all over the region, especially in the 25 geosites related to geology and geomorphology, which are strengthened by a large number of educational, archaeological, historical and botanical sites, mostly connected by a network of well signposted hiking trails.

EXAMPLES OF POLYCYCLIC INTRUSIONS IN GRANITIC MAGMAS IN SARDINIA (ITALY, WESTERN MEDITERRANEAN SEA): SOME GEOMORPHOLOGIC CONSIDERATIONS

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Keywords: geomorphosites, granitic intrusions, Sardinia, Italy.

Despite the occurrence of spectacular forms in the granitic basement of Sardinia, the geomorphosites in these environments are still poorly known. Morphosites of geological interest in northern Sardinia are mainly located along the coastline and were shaped into spectacular landscapes by marine processes. Recent geological surveys, which have focused on the evolution of the hydrographic network of northeastern Sardinia, have outlined examples of morphosites of geological interest that are linked to the complex evolution of pluton emplacement. Schematically, the major plutonic units in the Sardinia batholith exhibit granodioritic and granitic compositions and are broadly crosscut by late-satellite stocks, which consist primarily of fine-grained granites and a dike swarm of basaltic and aplogranitic rocks. Two outcrops, the Cala Sarraina and Fizza Ona sites, which are near a northeastern Sardinian coast town, are good examples of morphosites along the edge of different plutonic units. These outcrops represent a well-exposed, pillow-like horizon that is observable in the field for at least 100-200 m. The first outcrop is underlined by the occurrence of the coast, whereas the second occurs as large scale tafoni (small to large scale cave–like features). The pillow-like horizon consists of sub-rounded elements of granitic and micropegmatitic rocks, which are dispersed within the fine-grained granitic host-rock matrix; these elements are commonly edged by a continuous, green-colored corona of aphyric rocks that does not exceed a few cm in thickness. In the field, the observed pillow-like structure resembles the mingling structures that commonly result from mafic and acidic magma interactions. However, under the microscope, these aphyric rocks may be classified as granophyres; graphic textures are commonly observed in the surrounding fine-grained rocks. In addition, a similar granitic composition is observed in samples from the investigated area, indicating that pillow-like structures may have resulted from the occurrence of local filter-press mechanisms under fast-cooling conditions (i.e., granophyric and graphic textures) during their emplacement in the upper crustal levels of satellite bodies. Overall, the two outcrops represent a good and rare example of the emplacement mechanisms of granitic magmas in the Sardinian batholith. The collapse, dismembering and complex uplift of several parts, which form the Hercynian collisional chain, favored the development of deep valleysand the incision of the erosional surface. The upper part of the plateau indicates a strong denudation process in the Sardinia block at the end of the Hercynian Orogeny (the so-called post-Hercynian pediplan), which was later shown to have originated primarily during Oligo-Miocene times. Many preserved forms, which underline the aforementioned denudation processes, support the occurrence of inselbergs that characterize the entire Gallura landscape and the northeasterly tilting northern block of the Sardinia basement in accordance with the Oligo-Miocene tectonic movements. Some characteristics can be used to determine the development of magmatic digestion; the first site, Cala Sarraina, is more mature than the Fizza Ona site.

THE INTERPRETIVE PANELS OF THE ESTRELA GEOPARK AS A TOOL FOR THE PROMOTION OF GEOLOGICAL HERITAGE

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Keywords: Design, Education, Interpretation, Geosites.

The territory of the Estrela Aspiring Geopark has a set of sites of geological interest, distributed over its 2,200 km^2, that lack interpretation, so, the geological history they contain is not understood by the generality of its inhabitants and visitors. Also, many of these geosites did not contain any type of interpretive structures, and those that had, where quite outdated. In this sense, the Estrela Geopark Association decided set this situation right, not only implementing new interpretive structures in many geosites, but also updating the existing ones that belong to the Serra da Estrela Natural Park. The field work was followed in permanence by the team's designer and the territory's managers, in order to verify the locations that visually allowed a better interpretation of the landscape, as well as the type of structure most appropriate for these places, ie. vertical or horizontal panels. In the high altitude areas of the Geopark, atmospheric conditions were one of the variables considered, since they have high incidence of solar radiation and, during the winter, snowfall is frequent. Having the places defined and the contents developed, terrestrial and aerial images were captured with the help of a drone, so that it was possible to show another perspective that would help the interpretation and of the landscape, namely of phenomena that occur in different time periods.

With all the necessary information collected and after listening the different technicians involved in this work, a unique, modern and appealing layout was created, allowing an immediate association with the Geopark. Based on the images. and amount of information with scientific thoroughness to be inserted, a limit of characters was stipulated. The layout of the panels was divided into sections: section for the panel title; section for the typology of the geosite(s); section for Portuguese and English text; section for main landscape interpretation photography; secondary photo gallery section; section for illustration, explaining the geological formation of the sites, in a simple and appealing way; section for location map of the geosite in the context of the Geopark; section for detailed map of geosites location and section for the technicians that worked on the panels. After that, several test prints to check the readability and luminosity of all the contents were made.

As such, this work intends to demonstrate the importance the conception of the interpretive structures has in the communication of science. The effectiveness of the interpretation of a Geopark lies, above all, in the way in which each territory can communicate and facilitate the access to contents, often restricted to a small group of scientists.

THE GREAT ROUTE OF THE ESTRELA GEOPARK AS A PROMOTION FOR NATURE TOURISM

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Keywords: Aspiring Geoparks, Sustainable development, Geotourism.

Between its geography and its historical and cultural context, serra da Estrela is facing new challenges today, anchored in its territorial identity, reflex of a diverse and multifunctional context. These new challenges embody a new paradigm for sustainability, based on the valorisation of its endogenous potential and on the refunctionalisation of its most identitary brands. Thus, it has been the aim of the Estrela Geopark to strengthen and / or foster the development of health, scientific, educational and nature tourism. Any of these products translate to a more sustainable, less seasonal and more territorial view of Estrela's tourism, to which we highlight the project of the Great Route of the Estrela Geopark, which, in an integrated and complementary way, aims at allowing the visit to large part of the territory of the Estrela Geopark, most of its geosites, and of all the municipalities that integrate this territory.

More than a Grand Route in the traditional sense, this project intends to establish a network of long distance and multi-stage routes, based on the old trail network of the Serra da Estrela Natural Park, connecting all the Geopark Doors and allowing a visit to all the territory and great part of its geosites. This network allows each visitor to choose the starting and arrival point, as well as their entire route, according to their interests and the time they want to spend while traveling through the Estrela Geopark.

Due to the unique characteristics of the Geopark, particularly in the higher altitudes, hiking is undoubtedly the best way to travel through its naturally irregular trails. However, a cycling route was also prepared, showing the best of the Estrela Geopark and its heritage for those who choose the bicycle as a privileged means for traveling and experiencing this territory. Visiting a region by bicycle is a profoundly different experience than by walking, even more in a mountainous territory like this, so, from the beginning of this project, a totally independent route was conceived, with complementarity to the walking version of the Great Route, and with the aim of providing an alternative point of view over the mountain.

The tourism phenomenon has in itself an inductive character, capable of promoting territorial resources and contributing to the valorisation of the endogenous heritage, it being an activity that is the engine for the development of many regional economies, when properly managed. By its nature, tourism is a complex phenomenon that integrates the political, economic, social, cultural, biophysical, ecological and aesthetic subsystems, and it is the symbiosis between these different domains that results in its sustainability. Thus, this project intends to be an innovative approach, based on the multifunctional diversity of the landscape of serra da Estrela, its geomorphological characteristics, its people and the stories of its history.

THE ESTRELA GEOPARK TOURIST PARTNERS NETWORK AS A SUSTAINABLE DEVELOPMENT STRATEGY

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Keywords: Partners, Tourism, Strategy, Sustainable development.

The Geopark Estrela Association's Strategic Plan for Tourism, elaborated for the period 2018-2022, identifies a broad set of strategic actions aimed at fomenting a new paradigm for tourism in this territory, of which we highlight the creation and enlargement of the Partners Network of the Estrela Geopark.

This future UNESCO Global Geopark believes that partners and partnerships are an important element in promoting the Estrela Geopark concept and brand, which are fundamental for the creation of solid and sustainable strategies. The notoriety of this territory, comprising 2216km^2 and around 150,000 inhabitants, will only be achieved if everyone works together and value the two pillars of the region's identity: heritage and local communities.

In this sense, Estrela Aspiring Geopark has structured four Partner Networks (Educational Partners, Institutional Partners, Business Partners and Local Producers), all of which work in different areas, but with a common goal, to enhance and preserve identity, in order to strengthen links and promote the territory, creating added value and promoting its integrated development. At the moment, one of the objectives is to expand the network so that the whole territory can be covered by the UNESCO Global Geopark brand, thus benefiting from the strategies that are inherent to this important classification.

Aware that the territories with the UNESCO brand have registered a growing demand, this partners network, intends to leverage the economic agents of the region and the local community, through its valorisation and later creation of tourist flows, work opportunities and wealth for the territory. Thus, working in a network makes it possible for the territory to gain scale and benefit from the existence of tourism products structured and transversal to the entire Geopark.

The establishment of networks and partnerships is an extremely important mechanism in building bridges for the community development process. It is these partnerships that bring the local agents and communities closer to tourists, thus constituting a strong tourism brand associated with the Estrela mountain range, with the objective of creating a destination capable of generating tourist flows, always having the principles of sustainability as a background.

The Estrela Aspiring Geopark recognizes that these partner networks can be the key to a diversified and qualified offer in Estrela territory. As such, we believe that a good tourism strategy will only succeed if we all know, believe and value the potential of this territory. In this way, the Estrela Aspiring Geopark will continue to work on the extension of these partner networks, together with all stakeholders.

In short, we intend with this work to demonstrate how the Partners Network of this Aspiring Geopark has been one of the main strategies for the sustainable development of the territory, enabling it with new instruments for the valorisation of its heritage.

GEOMORFOLOGICAL EVIDENCE OF THE RECENT EVOLUTION OF SAN GIOVANNI CAVE (DOMUSNOVAS, SOUTHWESTERN SARDINIA, ITALY) IN THE PARCO GEOMINERARIO DELLA SARDEGNA

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Keywords: Geomorphological evolution Cave evolution Geopark Sardinia Italy.

The study analyzed the geomorphological features of the Domusnovas karst area located in the Geopark of the Sulcis-Iglesiente District (Parco Geominerario della Sardegna), a vast abandoned mining area among the most important in Europe. The investigations concerned the morpho-quantitative detection of karst cavities located in the calcareous complex of Mt Acqua with particular reference to the Grotta di San Giovanni, an imposing cave-tunnel with sub-horizontal development. This cave develops for about 850 m through the lower Cambrian limestones that have undergone the effects of ancient and recent tectonics movements that have determined a fold with an east-west oriented axis. The cave-tunnel, one of the few in the world, is crossed by a road that allows the entrance to the upper part of the hydrographic basin that formed the same cave. The area of the cave has been inhabited since ancient times as evidenced by the numerous archaeological remains dating from over 6000 years b.C. Two megalithic walls (still undated) enclosed the two entrances to the cave that were subsequently unused with the success of the Nuragic Civilization (Bronze Age, 1800 b.C.) which developed throughout Sardinia. A Neolithic deposit has been identified near the northern entrance of the cave, this deposit is resting on a level referable to the upper Pleistocene which allows to reconstruct the flow rate of inland waters and the corresponding alluvial terrace in the opposite entrance, the southern one. Some organic remains and ceramic fragments allow us to define the age of the deposit with a certain precision and to correlate the deposit to a ceramic vase discovered during the exploration of the cave, some decades ago. The study of surface hydrography and the flow of groundwater has allowed the partial reconstruction of the evolution of the original cave at least in its main conduit, it is not yet known the age of formation of the cavity and the phases of morphological evolution that are documented by the well preserved deposit levels and by the erosion surfaces within the cave. The Neolithic deposit also shows the closure of the deposit sealed by a partially destroyed concretion. The important incision produced by the waters of superficial flow inside the tunnel is correlated to the progressive raising of the northern pillar, where the cave of San Giovanni is located, of the Cixerri graben, the tectonic valley that characterizes this portion of Sardinia. These factors allow us to hypothesize a definite formation of the cavity only starting from the Tertiary (Miocene?) and are under observation in order to concretize this hypothesis. According to the Global Network of National Geoparks the main objectives of Parco Geominerario is the protection and conservation but, mainly, education to understand the geohistory for the local population to support and preserve the territory for the next generations. The objective of this study is to provide as much information as possible to create a database for one of the most important geomorphosites in Sardinia, today still largely ignored by much of the Sardinian and Italian population.

GEOSITES OF HISTORICAL AND NATURAL HERITAGE FROM THE SIERRA NORTE GEOPARK (SPAIN): CAREQ, RESEARCH AND A PROPOSAL OF SPZ MANAGEMENT

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Keywords: Geosites, Historical heritage, Management.

The Natural Park and Geopark (2011 approval) of the Sierra Norte of Seville (Andalusia, Spain) covers 177.484 hectares of a geological and geomorphological sector of the Meridional Hesperian Massif. The limestones of the Cambrian units of Ossa-Morena and the Devonian ones of the South-Portuguese present in the area are contributing to the geomorphological karst evolution (and endokarst) of the Palaeozoic shield. The General Research Project Caves and Quaternary Archives in the Sierra Norte of Seville (CareQ, 2010-2019) (Research Group Quaternary and Geomorphology, PAI RNM 273, Universities of Cordoba, Seville and Huelva), signed an agreement with the Speleological Society Geos (Seville) and as carried out a geoarchaeological study on the prehistoric communities of predatory and producer societies which inhabited endokarts of the Gpark. Three caves have been studied systematically and incorporated into the Park Geosites network: La Sima (Constantina), Ocho (Cazalla de la Sierra) and Covachos (Almadén de la Plata). La Sima cave has an Upper Pleistocene sedimentary archive with a huge paleontological register (wild bulls, rhinos, horses, bears, lynx, hyenas, etc) and lithic industries from the Middle Palaeolithic, and land occupancy from the Middle Holocene with burial objects, ceramics, lithic industries, necklaces beads, etc. The Cueva del Ocho shows a record with abundance of archaeological rests since the Early Neolithic (ceramics, milling and hammer elements) and display of rock art (engravings and paintings). Finally, Covachos cave also presents an occupancy from Upper Holocene (Copper and Bronze Age) and lots of rock engravings. The historical knowledge of the existence and location of these three caves, their good accessibility and the lack of police have resulted in the loss of and destruction of their archaeological and geomorphological heritage by means of pillaging actions and of and clandestine excavations. To revert this situation three actions are proposed for the conservation of the natural and historical heritage through an integral management: 1) the creation of a new protection label as special protection zone (SPZ), for the cave geosites and its posterior incorporation to the PRUG (management plan) (2004 Approval Decree, renewed in 2012), with an effective penalty system. This SPZ could be incorporated as a category into the existing Zonas de Usos Restringidos figure. 2) to create and approve a Special Management Plan (SMP) for this SPZ, with criteria of geotourism and pedagogy. It is fundamental that the SMP has a monitoring programme and a multiannual validity. 3) The future SPZ geosites should be part of the Catálogo General del Patrimonio Histórico (General Catalogue of Historical Heritage) of the Junta de Andalucía, as Bienes de Interés Cultural (BIC) in the typology of Zonas Arqueológicas (Archaeological zones).

THE ASPIRING JERSEY GEOPARK

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Keywords: geotourism, landscape, geoarchaeology, geotrails, granite.

The geology of Jersey is unique in the Channel Islands and different from the other islands in the Normano-Breton Gulf; it also differs from that of Normandy and Brittany. The rocks, their colours and their structures are a window which reveals how Jersey was eroded into a small flat-topped hill and then the present-day island. Jersey consists of a striking variety of sedimentary and igneous rocks, varying from shales, greywackes and conglomerates to extrusive andesites, rhyolites and ignimbrites and several varieties of plutonic granite and diorites and gabbros. In addition, these are intruded by various minor intrusive dolerite and lamprophyre dykes. These are overlain by superficial deposits formed during the Ice Ages, such as loess, and during the Interglacials, such as raised beach gravels and peat with tree stumps. These range in age from c. 700 Ma to the present day, with the majority of rocks being between Precambrian (> 550 Ma) and Palaeozoic (c. 400 Ma). There is a large time-gap after the formation of these rocks, when they were eroded into hills on a coastal plain by seas which deposited chalk and limestone formations, the recent deposits being of the Pleistocene (c. 2 Ma) and Holocene (c.10,000 yrs bp) periods. Our Ice Age story unfolded during a time when we alternated between a low-plateau landscape when loess was deposited, and an island landscape when three raised beaches were deposited. Prehistoric humans lived in two major sea cave and rock shelter sites, giving us faunal deposits, followed by peat and woodland giving us floral deposits. Each of the protected Geological Sites of Special Interest in the aspiring geopark act as a staging post on a Jersey Geology Trail along a unique geological heritage route. Our approach emphasises our Geology but will include other coastal and inland sites of interest for Marine Biology; Flora and Fauna; Mycology; Entomology, Ornithology, Archaeology and Vernacular Architecture to present a complete picture of Jersey's environment.

LANDFORMS CONTRIBUTE TO PLANT BIODIVERSITY IN ROKUA GLOBAL GEOPARK, FINLAND

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Keywords: Research, Biodiversity, Geodiversity, Geomorphology, Landform.

The diversity of abiotic nature underpins biodiversity and in recent studies geodiversity (the diversity of geology, geomorphology and hydrology) has been recognized as an important determinant of landscape-scale biodiversity. However, there is a lack of studies where the relationship between geo- and biodiversity is examined at local scale. In this study, we explore the contribution of landforms for vascular plant species diversity in Rokua UNESCO Global Geopark area, Finland. Specifically, we seek answers to two main questions: (1) are there differences in biodiversity between distinct landforms (such as kettle holes, dunes or river shores) and control sites (i.e. sites without any distinct landforms), and (2) how does biodiversity vary among different landforms. To gain answers to these questions, we compare vascular plant species richness measures, several diversity indices and local contribution to beta diversity at altogether three levels of biodiversity (alpha, beta and gamma) for different landforms and control sites. Based on the results, most of the landforms are more diverse than control sites. Moist, hydrologically and microtopographically variable landforms, such as gullies and river shores, have especially high plant species diversity at all three levels. These results encourage exploring and integrating local-scale geodiversity and biodiversity in further studies and in conservation planning. In addition, this study is an encouraging example of how Geoparks can contribute to scientific research.

DEADENDER: USE FOSSILS TO EXPLORE THE PROCESS OF BIOLOGICAL EXTINCTION IN CAUSSES DU QUERCY GEOPARK

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Keywords: phosphate caves, paleontological heritage, artiodactyls, biological extinction.

Funded by the French National Research Agency, DEADENDER research program (DEcline of ArtioDactylsENDemic of EuRope) aims to explore the processes of the biological extinction called the "Grande Coupure", that took place 34 million years ago, at the Eocene - Oligocene boundary. It will use the fossil record from the Quercy phosphate infillings as a unique natural laboratory for evolution that belong to Global Geopark UNESCO "Causses du Quercy". It differs from previous analyses on Quercy faunas, by focusing on a precise clade, in a phylogenetically constrained framework, and in a restricted geographical area. Instead of a general picture, to focus on endemic european artiodactyls will allow to realize an unprecedented in-depth dissection of an extinction. Restricting the spatial frame to Quercy karstic infillings eliminates discrepancies in taphonomic biases between fossiliferous sites. The results should be considered as "evolutionary natural experiments" that ran over millions of years during the Cenozoic.

This research program will investigate the response of endemic European artiodactyls to modifications of their environments, and the impact of biotic and abiotic drivers on their specific diversity and final decline. It will use an innovative approach combining the most accurate fossil record available so far at the world scale for that period with cutting-edge analytic methods, in terms of both morphological investigation and analyses of diversity dynamics. For this, will be undertaken the first phylogenetic analysis of artiodactyls including the many European endemic species. Also, DEADENDER will explore their paleoecology using 3D reconstruction methods for endocranial structures, and 3D dental microwear textural analyses in order to trace the evolution of biotic factors related to life history traits and sensory abilities (body mass, diet, orbit size, relative size of brain component, neocortex complexity, inner ear characteristics).

Coordinated by ISEM ("Institut des Sciences de l'Evolution de Montpellier") and regrouping several university teams (Lyon, Mons, Poitiers, Toulouse), DEADENDER will be carried out in close co-operation and with the support of an extremely active regional network, gathering the "Phosphatieres du Quercy" association, the touristic site of Cloup d'Aural, the geological national reserve of Lot department and the Global Geopark UNESCO "Causses du Quercy".

IMPLEMENTATION OF THE GEOPARK MODEL BASED ON THE ECORREGIONS IN THE STATE OF CHIAPAS (MEXICO)

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Keywords: Aspiring Geopark, Chiapas, ecorregion, traditional knowledge.

In the 21st century, we live in an interconnected world thanks to the technological advances that are the result of a culture based on scientific knowledge. These advances have been spectacular, but in most cases, they do not transcend scientific disciplines. To understand and survive in a globalized world, movements have appeared in recent years that tend to integrate scientific knowledge and traditional knowledge of local communities.

This trend is aligned with the paradigm of conservation of nature represented by the International Geoscience and Geoparks Program (IGGP). This Program recognizes and supports communities that have learned to manage a geological heritage of international relevance in a sustainable manner and integrated with the rest of the natural and cultural heritage that identifies their territory. This management is effective when it is based on the active participation of local communities, which provide traditional knowledge.

In 2015, the authors participated in the first meeting held in Mexico with representatives of the World Geoparks Network and UNESCO, which was held at the Institute of Geology of the National Autonomous University of Mexico (UNAM). Inspired by this meeting, a team from the Secretariat of Environment and Natural History (SEMAHN), in the State of Chiapas, has expanded the strategy of conservation and dissemination of the State's natural resources. This strategy has incorporated in its field of action in Chiapas the conservation of natural and cultural diversity (including intangible heritage), territorial ordering, sustainable development (based on local products and geotourism) and climate change. All these elements coincide with the strategy of the Geoparks and the 17 Sustainable Development Goals.

In Chiapas, as a result of this activity supported by the SEMAHN, the territories known as "Ecoregions" have adapted naturally to the holistic management model of the Geoparks. Implementing this model, some of these Ecoregions could be converted into Geoparks: Center, Isthmus-Coast, Jungle, North, Highlands and Border. "Between Canyons-Central Depression of Chiapas", the "Meseta Comiteca" or the "Chichonal Volcano", are some of its geological values.

VALLEYS OF CANTABRIA ASPIRING UNESCO GLOBAL GEOPARK

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Keywords: Aspiring Geopark, Geotourism, Sustainable development, Cantabria region.

The Atlantic Geoparks project, funded by the Interreg Atlantic area programme, aims to highlight the Geoparks of the Atlantic area. This Spanish candidacy consider the declaration of a geopark in Cantabria region, called Valleys of Cantabria (Asón, Miera and Soba). The territory covered is about 800 km2, including 20 municipalities and more than 61,000 inhabitants. A database including more than 50 geosites, natural elements and cultural points of interest has been constructed. These geosites are based on criteria as type of interest, intrinsic or scientific value, potential of use, presence of other complementary values or existence of protection figures. Among others, coastal and aeolian, karst and glaciers landscapes can be found, as well as other stratigraphic, tectonic, and paleontological features.

The coastal area of the geopark concentrates a high diversity of environments highly representative of littoral zones of medium latitudes. Barchan and longitudinal dunes in an orthogonal framework climbing the mountainside constitute the relevant dune system of Sonabia. There are also numerous peat bogs with ages ranging from 10,000 years B.P. and 2,000-5,000 years B.P. The fossil forest of Trengandín beach indicates that between 2,890-4,070 years B.P. the sea level was at least 2 m below the current one. The Asón area is internationally recognized for its varied and rich underground heritage with more than 4,000 caves explored. Some of these caves have been used as shelters, at least, during the last 45,000 years (remains paintings of Covalanas cave, World Heritage of UNESCO, have been dated in about 20,000 years). The maximum glacial development of this area occurred between 44,000 and 29,000 years B.P. Glacial remains appear at levels around 600 a.s.l., the lowest of the Iberian Peninsula. The declaration of a geopark constitutes a great opportunity to promote the geotourism and development of the territory. Geopark contributes to the 2030 sustainable development goals in the territory. Development through sustainable geotourism is one of the key pillars of Valleys of Cantabria aspiring Geopark. It will create job opportunities for the local communities through tourism, but also through the promotion of local culture and products. Also, it will aim to give local people a sense of pride in their region and strengthen the identification with the area. In addition, local communities and visitors learn to live in harmony with nature. Finally, it will improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

ASPROMONTE GEOPARK PROJECT: COMMUNICATION AND SCIENTIFIC DIVULGATION OF A UNIQUE GEOLOGICAL HERITAGE

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Keywords: Metamorphic rocks, Variscan vs. Alpine Geodynamics, Eolic erosion geomorphology.

The Aspromonte Massif, belonging to the Calabrian Peloritani Orogen (CPO), represents the southernmost termination of the Italian Peninsula. It constitutes the natural continuation of the Apennine chain, which overlooks the Messina Straits, continuing into Sicily with the Peloritani Mountains. Not with standing this physiographic continuity, the Aspromonte Massif, together with the rest of the CPO, is geologically very different from the rest of the Apennine chain in view of the characteristic crystalline basement rocks outcropping here.

These are the result of an ancient geological history from the Paleozoic up to the recent seismogenic tectonic activity of the Cittanova and Scilla faults, passing through the syn-orogenic clastic deposition of the Stilo Capo d'Orlando Formation and the evaporitic deposits, which testifies the Messinian salinity crisis.

This peculiar geological heritage allows the preservation of an articulated geodiversity that contribute to the unraveling of two orogenesis (i.e.Variscan and Alpine), testified by the presence of intensively deformed metamorphic rocks, involved in two orogenic cycles as well as in the occurrence of syn-orogenic sedimentary deposits, characterized by wonderful eolic erosional shapes, covered in turn by the back thrusting of the Varicolori Clays and the final deposition of the Gessoso-solfifera succession.

This articulated geological history opens up the possibility to locate, within the boundaries of the Aspromente National Park, 89 geosites, eight of which are of international importance and five inserted within territorial and cultural landscape units.

For this reason, the candidature of the Aspromonte as a UNESCO Global Geopark is necessary to reflect on the fact that what is lost in this heritage can be never restored or rebuilt, and it is therefore necessary to understand and proceed with its protection.

This is even truer the more the Memory of the Earth is enclosed in a protected area and/or in a Geopark, in whose concept of management the holistic approach to protection, education and sustainable development is inherent.

In this view, the interpretation of the geological landscape has to focus its attention not on a single scientific notions, illustrating facts and isolated data, but on themes that meet the curiosity, imagination, interest and liking of those who receivethem.

The results are good experiences of knowledge of the book of the earth, feelings and emotions of amazement and wonder about the birth and evolution of a territory, starting from the geological matrix with the aim to contribute in its conservation and development.

JERSEY ROCKS: FROM AN ARTIST'S PERSPECTIVE

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Keywords: communication, education, artists, geology, Jersey.

Jersey is a small island of 120 sq km with a rich cultural and natural heritage. Surveys carried out by Jersey Heritage over several years have established that local people closely identify 'heritage' as 'landscape' and at the key geosites in Jersey there is a strong and significant crossover between geology and the cultural and natural heritage. Scientific disciplines such as archaeology, biology, botany, geography and geology form the basis for our understanding of the evolution of the landscape and are engaged in education and interpretation. Artists, linguists, photographers, poets and writers interpret and communicate ideas about the landscape in different ways. They all have a role in raising awareness of Jersey's natural, cultural and intangible heritages.

This poster will focus on the work of one artist who has been inspired by the geology of Jersey. Anne Chowne has a background in education, being formerly the Art and Design specialism lead for the Primary PGCE course at UCL Institute of Education and now devotes her time to printmaking. She is a member of the Printers Inc group and has exhibited at the National Centre for Craft and Design and Harding House Gallery, both in Lincolnshire, UK. Anne works closely with the archaeologist and photographer Peter Chowne, who is currently assisting Jersey Heritage with a number of cultural heritage projects.

One of her current projects 'Jersey Rocks' focuses on the geology and botany of the intertidal zone and builds on her study of buried and emerging landscapes in the fens of Eastern England. The work featured in the poster is based on rocks and plants visible around the island, where there is evidence of the sedimentary rocks having been metamorphosed by the later granitic intrusion. Where the contact zone between the North-west Granite and the Jersey Shale Formation occurs, there are many interesting mineral developments to stimulate creative endeavour. Although each rock can be categorised, Anne's designs combine colour and pattern to represent the unique history of each stone.

The aim of this project is to create a dialogue between artists, educators and scientists working on the Aspiring Jersey Geopark for the benefit of the local community. Many members of the public pass the rocks and raised beaches as they walk their dog, go for a swim or find a nice spot to picnic without realising the rich visual heritage under their feet. It is Anne's aim to draw attention to these natural features and illustrate how beautiful and amazing they are. Once engaged in looking more closely the public will interrogate the particular make up of each rock. This will raise questions about the differences between rock formation and why Jersey has such a rich abundance. It therefore contributes to the Education and Culture Focus Areas of UNESCO Global Geoparks and demonstrates the way that Jersey Heritage is taking an holistic approach to creating the Aspiring Jersey Geopark.

KÜTRALKURA UNESCO GLOBAL GEOPARK FOR THE SUSTAINABLE LOCAL DEVELOPMENT OF THE ARAUCANIA REGION, CHILE

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Keywords: Kütralkura UNESCO Global Geopark, Sustainable Local Development, Araucania Chile.

After ten years of collaborative work among various public and private institutions, local organizations, and four municipalities, Kütralkura was officially recognized in April 2019 as the first UNESCO Global Geopark in Chile. This recognition contributes to the consolidation of the long-term vision and planning of the territory based on a holistic concept of sustainable local development, conservation of natural and cultural heritage, and education. The Association of Cordilleran Municipalities of the Araucania (AMCA) leads this effort. The Kütralkura UGG extends for about 8,100 km2 in the Andes of the Araucania Region, southern Chile, where more than 70,000 inhabitants live in extensive rural areas of the municipalities of Melipeuco, Curacautin, Vilcun and Lonquimay. This territory has a geological history that records more than 200 million years related to the active tectonic margin of western South America. The Araucarias UNESCO Biosphere Reserve highlights the ecological value of the araucaria forests present in the area. In addition, the presence of Mapuche communities, whose worldview is connected to respect and care of nature, is one of the main components of the cultural heritage.
Kütralkura UGG is now widely recognized at local, regional and national level as a key factor in the economic development of the Andean destination of the Araucania Region and particularly for the four municipalities involved. The challenges for the future are multiple, particularly those related with the establishment of policies and strategies that ensure the development of geotourism, geoconservation, and educational programs based on natural and cultural heritage. Also challenging is the reinforcement of the governance model to ensure the active participation of local actors in its management, especially of the indigenous communities.

GEOEDUCATION IN ACTION IN THE AROUCA UNESCO GLOBAL GEOPARK: THE «ILLUSTRATE YOUR SCHOOL» EDUCATIONAL PROJECT

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Keywords: Arouca UGGp, Active citizenship, Geoeducation, Illustration.

Geo Education is pivotal for Arouca UNESCO Global Geopark (UGGp, Portugal), which consider several different areas on its educational programs and projects [geology, biology, archaeology, history, among others] under a holistic approach. The «Illustrate your School» educational project is a good example. The main goal of this project is to bring closer younger generations and the local heritage, and therefore to sensitize them to the importance of protecting it. It also intensifies the sense of belonging to a UGGp. This project started in 2006 when the Educational Charter developed by Arouca City Council allow the requalification several schools located in the area of Arouca UGGp. In the context of this requalification the management structure of Arouca Geopark [AGA – Arouca Geopark Association] suggested the replacement of the older schoolrooms designations, adopting new ones, about natural and cultural heritage located nearby each school. In this sense, the selected new names for all the compartments of each building [room classes, atrium, canteen, gymnasium, among others], aim to stimulate knowledge about local heritage. This «Geoeducation in action» educational project consists on school competitions, where pupils are challenged to individually illustrate the previously designated "heritage" for their respective room, applying drawing techniques after fieldtrip or thematic sessions, contributing to make the school more beautiful and colourful. The «Illustrate your School» competitions started in 2016/2017 school year, in the Burgo Primary School, under the geological theme «Route of the Geosites of the Arouca Geopark illustrated». In the following school year, two more primary schools benefited from the project. One from Rossas parish, under «School in the Nature» theme, and other one from Escariz parish, under the «Heritage at your door» subject. Rivers and biodiversity were the natural heritage chosen to designate all compartments of Rossas Primary School. The one from Escariz was decorated with illustrations of the cultural heritage from Escariz parish, namely, the archaeological sites. The last school competition (2018/2019) was hosted by Chave and Boavista Primary Schools, under the theme «Discovering the Forest» and «Eulália Memories», respectively. Illustrations related to the Chave local forest and the archaeological sites, stories, myths and natural places from Santa Eulália parish were studied and prepared to enrich these schools. More than 800 pupils and 50 teachers of the Arouca UGG were involved in this educational project, which promote an active citizenship. For the next school year (2019/2020) the «Illustrate your School» educational project will be promoted in the same way, through illustration school competitions, in the primary schools of Canelas and Serra de Vila. In the future we foresee to complete all the other Arouca Schools.

SERIDÓ GEOPARK PROJECT PROMOTING REGIONAL DEVELOPMENT IN RIO GRANDE DO NORTE, BRAZIL

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Keywords: Aspiring Geopark Seridó, Rio Grande do Norte, Brazil.

The Seridó Geopark Project is formed by six municipalities (Cerro Corá, Lagoa Nova, CurraisNovos, Acari, Carnaúba dos Dantas and Parelhas), in an area of 2,803 km2 showing a geological history, with remarkable geodiversity, that dates back more than 2 billion years, associated to several mineral occurrences, with special empashis on the largest deposits of scheelite (tungsten ore) in South America. There are geomorphological features that range from depressions, plateaus and mountains with unique landgeoforms. The river spring that gave its name to the "Rio Grande" do Norte State and several archaeological sites that associated with important elements of geodiversity (minerals and rocks) show a cultural identity with more than 10,000 years. This geodiversity of exceptional and international value configures a unique geological heritage that, added to the cultural heritage, is included in a Brazilian exclusive biome – the caatinga – with fauna and flora not found elsewhere on the planet. The territory has been working since 2010 and today has countless actions related to conservation, education and tourism. In this scenario, the project take an important role in stimulating, through adapted communication, the conservation, education and tourism triad, allowing the local community and visitors to live enriching experiences, making them participatory actors and not just simple observers of landscape. Contributes to make the region a reference destination, providing unique scientific, educational, tourist, environmental and cultural experiences. Based on the environmental and cultural potentialities of the territory, various projects are worked out with emphasis on: (i) The Five Senses of the Seridó Geopark: Geodiversity, Geoheritage, Geoconservation, Geoeducation, Geotourism (education project for children, youth and adults); (ii) Geoproducts (handicrafts and gastronomy); (iii) Training of guides and leaders of tourism stakeholders; (iv) Seridó Geopark App; and others. Currently with strong support of municipal and state managers (City Halls, City Councils, guides associations, craftsmen, Rio Grande do Norte State Government, State Secretary of Tourism-SETUR, Potiguar Tourist Promotion Company-EMPROTUR, State University of Rio Grande do Norte-UERN, Institute for Sustainable Development and Environment-IDEMA, State General Attorney-PGE), besides federal entities (Federal University of Rio Grande do Norte-UFRN, Brazilian Geological Survey-CPRM, Institute for the National Historic and Artistic Heritage-IPHAN) and also the Brazilian Service to Support Micro and Small Enterprises-SEBRAE, National Service of Commercial Learning-SENAC, Association of Municipalities of the Micro Region of Eastern Seridó-AMSO and Brazilian Bar Association for the Rio Grande do Norte-OAB/RN, but mainly with the support from the communities inserted in the territory, the Seridó Geopark began to become reality as a sustainable development project in the countryside of Rio Grande do Norte, through the use of abiotic (geodiversity) and biotic (biodiversity) heritages and local cultural features, joining the natural and cultural heritage.

RURAL WELL-BEING: KEY TO AN INCLUSIVE AND SUSTAINABLE DEVELOPMENT IN THE FUTURE OF GEOPARK GLOBAL UNESCO KUTRALKURA OF CHILE.

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Keywords: Well Being, KútralkuraGeopark, Sustainable development, inclusive.

Chile is among the countries with high social progress. However, it is also one of the most unequal countries in Latin American.

In the Araucanía region, where the Kútralkura Geopark is located, rural-urban migration has increased, and a reterritorialization process has been generated. Indigenous property has been extended and recuperated by an active claim movement.

Additionally, migration processes of the region and the Andean region are influenced by cross-border exchanges.

The base hypothesis is that the way of understanding rural well-being can be in part common to all the different groups of population present in the territory: settlers, farmers and Mapuche, and at the same time, different.

The need to analyze and measure the concept of rural well-being is considered, and its incorporation into the formulation of public policies that facilitate the human, integral, inclusive, solidary and sustainable development of the rural territories in general and the commons of Melipeuco, Vilcun, Curacautín and Lonquimay, which form the Kutralkura Geopark, in particular, is required?.

UNESCO Geoparks are models of territorial management in areas with a significant geological, cultural, and natural heritage. The Geoparks seek, among other objectives, to contribute to the achievement of the 2030 agenda (ODS).

Araucanía presents the lowermost social, economic and social cohesion indicators in the country. Therefore, it is important to incorporate the concept of rural well-being into the agenda of Kutralkura Geopark in the Andean region of the Araucanía, as a bottom-up model of rural territorial planning.

LANZAROTE AND CHINIJO ISLANDS UGG: A JOURNEY TO THE CENTER OF EARTH THAT WILL BRING US TO MARS

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Keywords: cave biology, astrobiology, evolutionary biology.

Lanzarote and Chinijo Islands UNESCO Global Geopark was declared in 2015 to protect the geological heritage of the island of Lanzarote and its surrounding five islets. This heritage resulted from the interaction between submarine and subaerial volcanic, erosive and sedimentary processes and has also favored the presence of unique, highly endemic biota on this group of oceanic islands. Since the 17th century, scientists from all over the world have visited the islands, regarding them as exceptional natural laboratories. Following on this tradition, the Lanzarote and the Chinijo Islands Geopark has hosted several cutting-edge research projects since its creation, bringing together planetary geology and astrobiology, as well as microbiology, evolutionary and conservation biology. Geologically, certain areas in Lanzarote are characterized as terrestrial analogs of Mars. These areas allow non-destructive essays linked to geological and astrobiological research by humans and robot in the Red Planet. Likewise, hydrothermal and alteration areas influenced by meteoric waters in the island serve as models for the interactions between volcanic rocks and water, which is a pivotal point for both habitability in Mars and understanding Martian geological history. In this regard, La Corona lava tube is particularly interesting. Within its 6 km of subaerial galleries and semi-submerged and submerged sections flooded by water with marine origin, the cave offers an opportunity to compare primary and secondary minerals both exposed and protected from solar irradiation. Penetration of marine waters into the cave is favored by the low altitude, scarce rainfall and the porosity of the volcanic materials along the coastline of Lanzarote. The water body inside the cave is partially isolated from the surrounding ocean and hosts a unique ecosystem, called anchialine and characterized by the presence of a unique biota, which consists in both ancient animal lineages, often categorized as living fossils, as well as more recent species extraordinarily adapted to the cave conditions. Some of these species belong to lineages otherwise restricted to the deep sea. This unique assemblage offers innumerable model organisms to address key questions in crucial evolutionary topics, such as adaptation, speciation and morphological change. In addition, two of these species are endangered and currently the focus of a multidisciplinary conservation project, which includes the mathematical analyses of their spatial distributions, and the description of their diets and microbiomes using next generation DNA sequencing. Similar lava tubes potentially exist on Mars and have been proposed as the best locations to search for biosignatures and traces of past aqueous activity in the planet.

EXPANDING RESOURCES FOR GEOTOURISM: CREATION AND SIGNALING OF FIVE NEW GEOLOGICAL ROUTES IN SIERRA NORTE DE SEVILLA UGG.

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Keywords: Geotourism, geological routes, interpretation.

In the Natural Park Sierra Norte de Sevilla - UNESCO Global Geopark, the design, creation and signaling of five new short-distance geological routes has been completed this last spring. These new resources have been made with public fund support from the Ministry of Tourism and Sports of the Andalusian Government,aimed at promoting tourism infrastructures located in natural areas of Andalusian municipalities.

The implementation of these geotouristic routes in Sierra Norte deSevillaGeopark has been resolved by a technical project for each route, which includes all the aspects that must be taken into account when designing a tourist route. The purpose of the projects is design an attractive geological route for all users, with a specific signage to interpret sites of interest along the route, and some signaling that indicate the route's way.

Aroute has beenimplemented in each of fivemunicipalities of the Geopark: El Real de la Jara, Cazalla de la Sierra, Constantina, San Nicolás del Puerto and La Puebla de los Infantes. Relatively short routes have been designed, with departure and return to a population, and passing through places of geological, natural, mining and / or cultural interest. Each route has a specific signage: A. Route start signal with the route map and a series of recommendations; B. Thematic signal, which includes some transcendent aspect of the route; C. Milestone signs, which outline important aspects that can be observed on the route; and D. path marker signals, which are placed at intersections and intends to guide the visitor along the route.

These geotouristic routes complement the existing infrastructure in the Sierra Norte de Sevilla Geopark, which has 21 public use trails signposted.

ARCHAEOLOGICAL RESEARCH IN THE POLLINO UNESCO GLOBAL GEOPARK, ITALY: PROBABLY THE ANCIENT CITY OF "LAOS"

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Keywords: archaelogical research, Pollino UNESCO Global Geopark, Lao-Mercure Valley.

The Pollino UNESCO Global Geopark is a large area located in southern Italy at the border of two administrative Regions: Calabria and Basilicata. In this area relevant geological and geomorphological features stand together with many natural and cultural assets. The Lao-Mercure Valley, in the central-west sector, is an important geosite of the Pollino Geopark. This valley was created by a wide tectonic depression and was occupied in the past by a Pliocene lake.

In the Mercure-Lao Valley is begun an interesting archaeological research, guided by Fabrizio Mollo, from University of Messina - Archaeological Mission of the Department of Ancient and Modern Civilizations, thanks to the concession of the Italian Ministry of Cultural Heritage (MiBAC) and thanks to the collaboration with the Pollino UNESCO Global Geopark.
The first survey was carried out in October 2018, and the archaeological excavation started in July 2019. The area interested by archaeological activities is a large hilly territorial basin, located along the high course of the Lao River, in the municipality of Laino Borgo. All these toponomastic denominations (Lao, Laino) have an interesting assonance with Laos, the ancient Greek sub-colony of Sibaris, that is mentioned in the historical literature, but the real place where this ancient town was located is still undefined.

The research discovered a structured presence between the Archaic-Classical and Hellenistic phases. The Roman phase is clearly visible near the Lao River, in the area south of the Santa Gada river-lake terrace, near the village of San Primo, where already in the 1920s Eduardo Galli had documented conspicuous archaeological finds dated back to the Roman-Imperial age.

In the area of Santa Gada terrace (the site reaches in the N-S direction and it is large about 0.4 sqkm) we recognized a large settlement, structured and organized already from the second half of the 6th century A.C., to the 3rd century B.C. It is a very important settlement throughout the wide basin of Lao-Mercure: the site is very interesting also for its particular geomorphology and for its localization in the middle of Lao-Mercure Valley, in a dominant location along the river. During the first excavation we can identify two different phases of life: the first is dated back to the Arcaic age (VI-V cent. B.C.), and it is characterized by indigenous or Greek finds (pottery, votive objects, coins). The second phase is identified by several structures dated back to the Hellenistic age (IV-III cent. B.C.), probably part of ancient Lucanian town, now not better identified.

FROM THE CLASSROOM TO THE MOUNTAIN: THE ESTRELA GEOPARK AS A STONE BOOK

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Keywords: Education; Communication; Estrela Geopark; Educational programs.

The geological history of serra da Estrela is an ancient one. It began more than 650 million years ago, with the formation of the oldest rocks of the Estrela Geopark. Later, other rocks formed and many geological and geomorphological processes occurred, giving rise to different forms of relief, in what is the most imposing mountain in Continental Portugal. Between mountains and valleys, plateaus and overdeepenings, granite boulders and rivers, we find an enormous biodiversity and a cultural identity that results from millennia of human occupation. With such geological, biological and cultural diversity, the territory of the Estrela Geopark constitutes a true stone book that, when read, can be an important tool for learning and building knowledge.

Issues related to Earth Sciences are not always easy to understand, especially when approached in a classroom context. Even when using teaching and learning facilitator methodologies, with the use of audiovisual media, not all students can easily understand the geological processes that occurred on Earth over its 4600 million years, as these are complex processes often difficult to imagine. In this context, the interpretation of the different landscapes of serra da Estrela allow the exploration of different topics taught in Schools, relating not only to geography, geology and biology, but also with history and archaeology, providing unique educational opportunities, such as a true open-air laboratory that facilitates perception and acquirement of knowledge considered essential for a better understanding of the history and evolution of Earth, life and its people.

The Estrela Geopark, with an approximate area of 2216km^2, has 124 geosites divided in 8 different themes, that range from sites that witness the recent glacial and fluvioglacial past of the mountain, to the oldest rocks of the territory, diverse granite landforms, panorama observation points, erosion by rivers, tectonics, the action of the cold, among others. Thus, the Estrela Geopark constitutes a territory with a remarkable heritage, where the work on sustainable development is sought in a holistic way, giving special focus to the promotion of Education and Science, as a strategy for Geoconservation and dissemination of scientific knowledge, since only one can preserve and value what is truly known.

With the aim of showing this fascinating book of stone, the Estrela Geopark has, since 2016, been promoting multidisciplinary educational programs that include outdoor and indoor activities, based on the programs established by the Ministry of Education and that directed to the three levels of Education, seeking to make available to the teachers a motivating and facilitating methodology of the teaching process, since the interpretation of the diverse landscapes of Estrela constitutes a tool of multiple learning, of knowledge and of pedagogical and didactic experiences, where the heritage, natural and cultural, is the living testimony of the dynamics of its landscape.

WORKSHOPS

UNESCO GLOBAL GEOPARKS AND GLOBAL AGENDA 2030 – FROM STRATEGY TO ACTION

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Keywords: Global Agenda 2030, Sustainable Development, Model Territory.

Global Change – what does it mean for mankind?
One thing is for sure – nothing stays the same. This ancient saying is truer more than ever – our environment, our whole planet and its giant systems, the climate, oceans, sea level and atmosphere are changing, with foreseeable massive consequences for the lives of all humans on Earth. In the light of these changes, which will have a massive effect on our life and that of our heirs, it is high time to stand up for the preservation of our natural basis, which is the survival base for our own existence.

The response of the world community: Global Agenda 2030:
In September 2015, after decades of negotiations, the United Nations have agreed with the Global Agenda 2030 on 17 Sustainable Development Goals (SDGs). This agenda with 169 sub-goals is aimed at ending poverty, hunger and inequality, protect the planet and opening the way for environmentally-friendly progress (the five "P" Planet, People, Prosperity, Peace, Partnership). The 193 member states of the United Nations have committed themselves to implement these goals by 2030, which now need to be implemented from the international level down to the smallest community.

How the UNESCO Global Geoparks can support the Global Agenda 2030 – from strategy to action:
For more than 10 years now and all over the world, UNESCO Global Geoparks have campaigned for a holistic understanding of our planet and its evolution. With their initiatives, environmental education and awareness programmes and projects, they place a special emphasis on conveying these natural interrelationships and the impact Man has on these. Their international activities are an opportunity for exchanging ideas with partners around the world. Thus the UNESCO Global Geoparks provide ideal model territories for implementing the Global Agenda 2030.
They provide ideal conditions for supporting the SDGs with their community participation and capacity building approach as well as their sustainable regional development activities. Evidenced by a compilation of SDG activities in European Geoparks and a workshop of the German Commission for UNESCO, the Geoparks focus predominantly on goals 3 (health and wellbeing), 4 (quality education), 8 (sustainable tourism), 12 (sustainable consumption and production), 13 (climate action), 15 (protection of terrestrial ecosystems and biodiversity) as well as 16 and 17 (forming networks and partnerships, international cooperation). Also relevant are goals 6 (water protection), 7 (renewable energy) and 11 (heritage preservation, settlement development).

In accordance with their potentials, Geoparks have been actively pursuing the Global Agenda 2030 with the SDGs for a number of years. Their experience and their regional as well as transnational approach make them ideal places to understand the relevance of the SDGs and also the responsibility of their implementation. Thus the UNESCO Global Geoparks form the decisive interface between international declarations of intent and concrete on-the-spot projects – which means the transformation from strategy to action.

THE AGENDA 2030 AND THE TRANSNATIONAL UGGps: THE MARBLE ARCH CAVES UGGp AND SDG 16 AS CASE STUDY

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Keywords: Agenda 2030, SDGs, Transnational UGGps, Cooperation, Peace.

After four years of the proclamation of the Agenda 2030 for Sustainable Development by the United Nations, it is interesting to understand the effective contribution of the UNESCO Global Geoparks (UGGps) for this major worldwide compromise. It is even more pertinent to understand how the transnational UGGps can contribute in their management plan for the implementation of the 17 SDGs of the Agenda 2030. As referred by UNESCO, the transnational UGGps "naturally cross-national borders, connecting the peoples of different countries and encouraging intimate regional, cross-border cooperation. It is through this strong cross-border cooperation that transnational UGGps strengthen the relationship between countries and contribute to peacebuilding efforts". In this context, through a research study about the contribution of the European UGGps for the Agenda 2030, especial attention was given to the role of a transnational UGGp as a case study of this research. For this purpose, it was selected the Marble Arch Caves UGGp. In this framework, the case study was based in the analysis of the progress reports of this UGGp (2015-2016) and to make a correlation between the developed activities and the 17 SDGs. The main challenge was to compare the results obtained with that analysis with the interviews done personally to some of the elements of this UGGp team and to some inhabitants living in this territory. Through this process, it was intended to obtain more detailed information about the awareness regarding the Agenda 2030 and which SDGs were more relevant for them in a daily basis. The analysis of the progress reports showed that the SDG16 only appears in the seventh position out of ten most relevant SDGs. However, in the interviews carried on in the territory, the SDG 16 appears in the first position, since it is considered very important to maintain peace, cooperation and sustainable development among the local communities. The main explanation for this reality is the fact of the discussion around Brexit and the uncertainty of the future for the local communities. In this sense, this work demonstrates that the Marble Arch Caves UGGp can be considered a vital territorial tool for peace and sustainable development.

SUSTAINABLE PATTERNS OF PRODUCTION AND CONSUMPTION IN THE LATIN AMERICA AND CARIBBEAN UNESCO GLOBAL GEOPARKS: CONTRIBUTION FOR SDGs 2 AND 12 OF AGENDA 2030

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Keywords: UNESCO Global Geoparks, Latin America and Caribbean, Sustainable Development, SDG 2, SDG 12.

The United Nations launched in 2015 the Agenda 2030 for Sustainable Development, assumed as a plan for planet, people, peace, prosperity and partnerships. This Agenda is composed of 17 objectives with 169 targets and 231 indicators. The UNESCO Global Geoparks (UGGps), as territories of education, science and culture for the sustainable development, have committed themselves to work in geoconservation, geoeducation and geotourism strategies, focused on the Sustainable Development Goals (SDGs) of Agenda 2030.

In Latin America and the Caribbean (LAC) there are so far seven UGGps: Araripe UGGp, recognized in 2006 in Brazil; Grutas del Palacio UGGp, ratified in 2013 in Uruguay; Comarca Minera UGGp and Mixteca Alta UGGp, designated in 2017 in Mexico; Kütralkura UGGp, recognized in 2019 in Chile; Imbabura UGGp, designated in 2019 in Ecuador; and Colca y Volcanes de Andagua UGGp, labelled in 2019 in Peru.

In the strategies and activities of these territories we can identify multiple contributions to Agenda 2030. Thus, in the scope of this work, an analysis was made of the impact of the four oldest UGGps of this continental region to the SDG 2 “End hunger, achieve food security and improved nutrition and promote sustainable agriculture” and SDG 12 “Ensure sustainable consumption and production patterns”. In this context, we realize that one of the main problems in the LAC region is the lack of sustainable agriculture due to the loss of productive soils, since this is the region most affected by the decrease in productivity in absolute terms by 27%. This reality has led to an exaggerated increase in the use of fertilizers and pesticides. Another problem in this region concerning the lack of sustainable production and consumption systems, where, for example, urban solid waste generation (USW) is increasing, estimating that 1.1 kg of USW per capita per day is produced, being 1.2 kg the world average. However, it is estimated that by 2025 in the LAC region this production will reach 1.6 kg of USW per capita per day, which would be above the world average, estimated at 1.4 kg. The UGGps of this could play a preponderant role in this region, once they can develop and implement strategies and measures, which can help to solve or mitigate these challenges.

CAPACITY BUILDING AND NETWORKING: MAJOR COMPONENTS OF THE CONTRIBUTION OF UGGps CONCERNING THE AGENDA 2030

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Keywords: UNESCO Global Geoparks, Latin America and Caribbean, UNESCO Chair, Agenda 2030, SDGs.

In 2015 the United Nations approved the Agenda 2030 for the Sustainable Development and was also formally approved the International Geosciences and Geoparks Programme (IGGP). The UNESCO Global Geoparks (UGGps) compromised since then to work for the achievement of the 17 Sustainable Development Goals (SDGs). However, the reality demonstrated that there is an incipient knowledge about the Agenda 2030 and their SDGs and targets. In this framework, the UNESCO Chair on "Geoparks, Regional Sustainable Development and Healthy Lifestyles" of the University of Trás-os-Montes e Alto Douro (Portugal), through their initiatives of research and capacity building has helped to arise awareness about the SDGs, especially in European and in Latin America and Caribbean UGGps, including Aspiring UGGps and projects in these fields.

This intensive work has been creating an increasing interest on SDGs subjects. This results from a gradual recognition of the benefit of considering SDGs as a priority in the development of master plans and in the definition of policies for action, conservation, promotion and land management. Thus, the recent research focused on several European and Latin American UGGps has demonstrated the importance of strengthening global partnerships to support and achieve many of the goals of the Agenda 2030, bringing together management structures, local politicians, stakeholders, educational agents and researchers. Despite the advances in certain areas, more needs to be done to accelerate progress on this domain.

The UNESCO Chair on "Geoparks, Regional Sustainable Development and Healthy Lifestyles" has been responsible for the development of several formative initiatives, especially the International Summer University, organized in Portugal (University of Trás-os-Montes and Alto Douro) and Brazil (Regional University of Cariri), and the Ph.D. research works developed on this context. In this sense, several workshops on the applicability and usefulness of SDGs have been developed. During these studies, the validity and the challenges of the applicability of the SDGs and their targets in the activities of the UGGps have been also evaluated. This reality has demonstrated the implications resulting from the socio-cultural dissimilarities between territories of different continental regions, with the priorities being markedly diverse. However, regarding to SDG 17, there is a unanimous agreement on the importance of strengthening and increasing the relevance of partnerships. The networking developed by the UGGps is increasingly seen as an example of good practices to be copied and implemented in other territories, towards the sustainable development of its local communities. In this context, all UGGps must refocus and intensify their networking efforts, in order to contribute more efficiently to the SDGs achievement.

A TASTER OF INTERPRETIVE SKILLS FOR GEOPARKS

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Keywords: Heritage interpretation, Non-formal Education, Training, First-hand experiences, Geotourism

Geoparks have become a tool for rural and sustainable development among many territories, and Geotourism is a growing niche with a high potential for sustainable tourism destinations. Nevertheless, professionals can have a tough time trying to present complex concepts and reveal the importance of Geosites to the visitors of the Geoparks, as well as to the local community.
Heritage interpretation is a structured approach to non-formal learning specialized in helping people in leisure to understand and explore the significance of an area, object or place. It aims to reveal meanings and relationships through the use of original objects, by first-hand experience, and by illustrative media, rather than simply to communicate factual information.
Professional heritage interpretation does four things: it provokes visitors' curiosity and interest in what may be an unfamiliar topic or theme; it relates the site or objects to visitors' own knowledge, experience, background and values; it reveals the significance of the site or objects that visitors can understand and appreciate; and it helps people to enjoy a satisfying experience.
Adding value to our day-to-day context means that heritage interpretation works towards community cohesion, knowledge building, sustainable development and conservation.
Heritage interpretation may be a crucial step in processing information at Geosites. Creating both cognitive and emotional links between visitors, community and other stakeholders of the Geoparks, in the long term means a more educated visitor and a greater commitment for conservation. Furthermore, Geointerpretation can help to achieve some of the SD Goals from the 2030 Agenda for Sustainable Development, for many of them demand proper understanding and management of natural heritage.
This workshop will offer a room for inspiration, knowledge sharing and skill development through taster activities focused on Interpret Europe's approach to heritage interpretation, and a short demonstration will show how such skills can be used on real phenomena.
Along with explaining the basic principles of heritage interpretation, the workshop will discuss questions such as how to engage people at geological sites, how to provide first-hand experiences and how the tools of interpretation can improve the quality of communication and positively influence Geoparks' work on education, conservation and tourism development. At the end we will have a toolkit to put strong ideas into words, to engage visitors in a meaningful and memorable way.
The workshop is intended for any professionals linked to Geoparks, to grasp briefly what Geointerpretation can do.

AMERICAN GEOPARKS: REALITIES AND IDENTITY OF A REGION

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Keywords: American Geoparks, Indigenous, Management, Geotourism.

Geoparks in the Americas are a recent initiative. Although the Araripe Geopark, the first on the continent, was recognized by UNESCO in 2006, it was not until 2013 that the second geopark in the Americas was designated, namely, Grutas del Palacio, in Uruguay. As of 2014, the number of geoparks on the American continent began to increase significantly. In 2019, there are 10 UNESCO geoparks in seven countries, while two new proposals in Canada are being evaluated. In addition, there are dozens of new geopark projects in various countries, particularly in Latin America, to the point that this region is emerging as one of the fastest growing in terms of the number of geoparks.

These geoparks, like those in the rest of the world, have an outstanding geological heritage of global significance. Furthermore, one of the distinctive features of geoparks in the Americas is the participation of indigenous communities in the management of projects and geotouristic activities. The governance systems of these communities and their particular uses of natural resources derived from traditional millenary knowledge constitute an outstanding element to show how society and geodiversity coexist and have developed. This coexistence contributes to the valorization of geological resources and promotes public appreciation of earth sciences, one of the central objectives of UNESCO geoparks. UNESCO geoparks have a prominent role in promoting respect for the traditions of the native peoples that inhabit the continent and contribute to both their social and economic development.

Within the GeoLAC (the Latin American Geoparks Network), there is a growing interest in establishing collaboration agreements with geoparks worldwide, and specifically with Canadian geoparks. Some proposals in this regard have come from the Tumbler Ridge UNESCO Global Geopark in order to organize exchanges between members of American indigenous communities living in geoparks. There is also an interest in promoting a UNESCO Chair on Indigenous Communities and Geoparks and organizing a meeting in the near future in one of the geoparks with significant indigenous presence.

ABC CONCEPT IN GEOINTERPRETATION

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Keywords: ABC concept, geopark, geoheritage, interpretation.

One of the most important tasks of the geopark leading to fulfilling its key mission is the smart interpretation of its geoheritage. The ABC concept offers an optimal way how to explain the mutual links between abiotic, biotic and cultural components of the geopark heritage enabling in this way the complex geographical understanding of its area. Generally, the geosites represent the sanctuary for various organisms, both plants and animals as well as for people both for religious or secular purposes. Mainly in the past, they also served as source of energy, both decorative and constructive material, for medicine, diet or as an artistic inspiration. It can be called the abiotic ecosystem services.

The both secondary and primary data were collected with the aim to identify and assess the way in which this interpretative concept is used in selected geoparks. The Colca and Volcanoes Andagua UNESCO Global Geopark (Peru) served as a case study in the frame of this qualitative research conducted during the summer 2019. The interpretation of each of the selected geosites was analyzed to detect how the interrelationships between its abiotic, biotic and cultural dimensions is clarified to its visitors.

The soil in the Colca Valley, which is predominantly of alluvial and lacustrine character with fragments of volcanic material, stands out for its natural fertility. This property encouraged the ancient Peruvians (including Incas) in the construction of *andenerias* (system of agricultural terraces) enabling to control the erosion of soils and landslides, water regime and properly manage the cropping systems. On the other hand, these platforms had modified the soil and climate conditions, in the way appropriate for an agriculture on steep slopes. There are many other phenomena related to the relationship between human activities and geological processes in the Colca Valley, documenting the human occupation of this geographical space like stone *colcas*, pre-Hispanic warehouses made of the local stone (volcanic and sedimentary) or *chullpas* (funerary stone towers originally constructed for a noble persons).

All these interconnections are well understood and perceived by the geopark team, however they fail to apply this ABC approach in their interpretative materials in a really systematic way. Much better situation has been identified regarding the local and indigenous guides, who are able interrelate local legends and myths as well as cultural monuments and traditions with the geological and other natural heritage of their geopark. The same pays for the other geoparks involved into this research.

There is a high potential of application of the ABC concept in the frame of interpretation of rich heritage of Colca and Volcanoes Andagua Geopark as well as of others geoparks. However, this potential needs to be activated in the form of comprehensive interpretation of interpretative panels, guides, leaflets and IT based means of interpretation.

TWO-EYED SEEING: RECONCILIATION WITH INDIGENOUS PEOPLES AT CLIFFS OF FUNDY

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Keywords: Indigenous History; Geoheritage; Aspiring Geoparks.

UNESCO Global Geoparks demonstrate the value of putting the Sustainable Development Goals into practice to foster peace and justice in communities around the world. Through dedicated partnerships and in the spirit of reconciliation, the Cliffs of Fundy Aspiring Geopark on Canada's rugged East Coast has worked to honour the Indigenous Mi'kmaq people. The shores of the Aspiring Geopark are the ancestral home of the Mi'kmaq, who have sought to bring to light the concept of 'Two-Eyed Seeing'. Two-Eyed Seeing means viewing our earth in two ways: with one eye focusing on Indigenous knowledge, and the other with a focus on Western Geoscience. When we use both eyes together, we have a fuller picture of our shared earth memory and a stronger future together. In practice, this means that equally significant to the geoscientific storyline of the Cliffs of Fundy is the rich history and deep significance of the aspiring Geopark for the Mi'kmaq, who have inhabited the region for more than 11,000 years. The geology of the region shaped the lives of the Indigenous Mi'kmaq peoples, and many islands, sea stacks, and geological formations are explained by Mi'kmaw stories passed down over thousands of years. Cliffs of Fundy is committed to preserving the Mi'kmaq culture and stories for future generations through educating visitors and locals alike.

INDIGENOUS PEOPLES IN THE MANAGEMENT STRUCTURES AND PROGRAMS OF UNESCO GLOBAL GEOPARKS: SUCCESS STORIES FROM THE TUMBLER RIDGE AND MIXTEC ALTA UNESCO GLOBAL GEOPARKS OF NORTH AMERICA

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Keywords: Sustainable development, Indigenous, Geotourism.

UNESCO Global Geoparks (UGGp's) are bottom up initiatives driven by the local communities with a mandate for sustainable development. The Indigenous Peoples of a Geopark are the original communities of the territory and have a clear connection with the land. Their involvement in the management structure is not only mandated by the UNESCO Global Geopark Guidelines, but is key to a successful authentic Geopark. Both the Tumbler Ridge UGGp of Canada and the Mixtec Alta UGGp of Mexico have prioritized the Indigenous communities within the management structures and programs of their Geoparks in a successful celebration of people and place.

Tumbler Ridge UGGp is located in northwestern Canada, at the junction of the Rocky Mountains and the Great Plains. It is the traditional territory of the Dunne-za, Tse K'hene, Cree and Saulteau peoples and a place where cultures and landscapes converge amidst wild forests and dinosaur footprints. The diversity of the territory leads to great opportunities to share the stories, histories and living cultures of the people, while navigating the socio-political interactions of so many Indigenous and non-Indigenous groups can create challenges for collaboration. The key for the Tumbler Ridge UGGp has been to create an Advisory Council where each cultural group is represented to provide guidance to the Geopark management. By creating a voice for each group, the Indigenous and non-Indigenous peoples of the Geopark territory can create meaningful projects with mutual benefit.

Mixtec Alta UGGp is situated at the boundary of two geological terranes in the Sierra Madre del Sur mountainous region of southern Mexico. The region has a rich cultural mix of Indigenous and non-Indigenous peoples. The Geopark has a council of Indigenous peoples who review key decisions and programs that relate to the land and the sharing of cultural stories. They also have an established guide program where Indigenous community members share their experiences along with the geological stories of the area.

With the Indigenous peoples of both UGGp's sharing their cultures and traditions in a way that supports the community, the Geopark bodies can then include these respectfully in their program. Sample projects within the Geoparks include sharing Indigenous language and stories, joint applications for language revitalization projects, archaeology, and the development of an educational curriculum.

Telling the stories of the land and jointly celebrating all cultures is a unique opportunity for Geoparks which opens up the opportunities for authentic geotourism within the sphere of global tourism where the quest for the unexplored and untold is at an all-time high.

ANTHROPOLOGY AND COLONIAL ARCHITECTURE IN THE MIXTECA ALTA UNESCO GLOBAL GEOPARK: RELATIONS WITH OTHER GEOPARKS IN THE EUROPEAN GEOPARKS NETWORK

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Keywords: Mixteca, Colonial Arquitecture, Lamabordos, Geoparks, EGN

This presentation attempts to describe, compare and relate cultural aspects that Mixteca Alta UNESCO Global Geopark (Mexico) have in common with two other Geoparks in the European Geoparks Network: the Villuercas Ibores-Jara UNESCO Global Geopark (Spain) and the Naturtejo UNESCO Global Geopark (Portugal). First, the colonial architecture of the Mixteca region (Oaxaca) presents similar architectural manifestations to the region of Extremadura where the Villuercas Ibores-Jara Geopark and the second, a system of agricultural bottom-valley terraces denominated in Mexico "lama-bordo", which we also found in the Naturtejo Geopark.

With respect to colonial architecture we can say that the Spaniards, when arrived in Mexico in 1520, introduced their technology, architecture and settlement patterns. To promote the collaboration and incorporation of indigenous people in the Colony, the Spaniards encouraged the construction not only of their villages, temples, convents-monasteries, civic palaces, squares, parks, roads and bridges, but also notable structures for people Indigenous of high status; rulers, nobles, merchants, and/or administrators. Several Spanish settlers, including the encomenderos of Yanhuitlan, Francisco and Gonzalo de Las Casas (from Trujillo, Extremadura), and their Dominican religious collaborators, administrators and merchants, included graduates of Salamanca and architects experienced in the construction of the great monastery-palace of the Escorial and Italy.

Under the supervision of the Spaniards, during the early colonial period, the capital of Yanhuitlan was moved from the summits and slopes of the hills to the flat lands of the Yanhuitlan Valley, and a lot of new construction and new urbanism take place. With Gonzalo de Las Casas, the chief Don Gabriel de Guzmán (Mixtec) and the Dominicans collaborated in the construction of the monumental Convent of Santo Domingo and in the construction of the Cabildo (town council), a great “Palace of Nine Patios”, beginning in 1557-1558. Instead of the Mixtec indigenous style like the royal palaces of Yucundaa-Pueblo Viejo de Teposcolula and the Casa de la Cacica de San Pedro y San Pablo, Teposcolula, the Casa del Cacique de Yanhuitlan is built in the Extremadura / Andalusian style of Spain. Therefore, and considering the relations of the Yucundaa, Teposcolula and Yanhuitlan palaces, and their background in Spain, it is essential to investigate-restore Yanhuitlan's and reproduce the 16th-century urban track and its aqueduct, and relate employers, styles and customs of the Mixteca with those of Spain

The other investigation show the Lamabordos, an invention independent of the pre-Christian era of the Mixtecos, directly related to the formation of large complexes of agricultural terraces on the slopes and streams of the hills of a very fragmented and poor region in plains or lands leveled to support agriculture. The lama-board system, which works to date in the Mixteca, encourages the production and accumulation of sediments sufficient to support the population and the impressive states (yuhuitayu), the region and the Mixtec civilization.

JUNTA DE ANDALUCIA
CONSEJERÍA DE AGRICULTURA, GANADERÍA, PESCA Y DESARROLLO SOSTENIBLE