

Guy Martini^{1*}, Nickolas Zouros², Jianping Zhang³, Xiaochi Jin⁴, Ibrahim Komoo⁵, Melanie Border⁶, Mahito Watanabe⁷, Marie Louise Frey⁸, Kristin Rangnes⁹, Tran Tan Van¹⁰, José Patricio P. Melo¹¹, Margaret Patzak¹², Asier Hilarario¹³, Setsuya Nakada¹⁴ and Artur A. Sá¹⁵

UNESCO Global Geoparks in the “World after”: a multiple-goals roadmap proposal for future discussion

¹ Global Geoparks Network Association, Haute Provence Geopark, Musée Promenade, 10 Montée Bernard Dellacasagrande, BP 156, 04005 Cedex Digne les Bains, France; *Corresponding author, *E-mail: guy.martini@hotmail.com*

² Department of Geography, University of the Aegean, University Hill, Mytilene, GR-81100, Greece

³ Geoheritage Research Center, School of the Earth Sciences and Resources, China University of Geosciences, Beijing 100083, P. R. China

⁴ Institute of Geology, Chinese Academy of Geological Sciences, 26 Baiwanzhuang Road, Beijing 100037, P.R. China

⁵ Centre of Tropical Geoengineering, Faculty of Civil Engineering, Universiti Teknologi Malaysia, 80990Skudai, Johor, Malaysia

⁶ English Riviera UNESCO Global Geopark, Floor 3-Roebuck House, Abbey Road, Torquay, Devon, United Kingdom

⁷ Geological Survey of Japan, National Institute of Advanced Industrial Science and Technology (AIST), 1-1-1 Higashi, Tsukuba, Ibaraki 305-8567, Japan

⁸ Welterbe Grube Messel gGmbH, Rossdörferstr. 108, 4409 Messel, Germany

⁹ Gea Norvegica Geopark, Porselensveien 6A, 3920 Porsgrunn, Norway

¹⁰ Vietnam Institute of Geosciences and Mineral Resources; Km9 Thanh Xuan, Hanoi, Vietnam

¹¹ Regional University of Cariri (URCA), R. Coronel Antônio Luíz, 1161, Pimenta, Crato - CE, 63105-010, Brazil

¹² Section on Earth Sciences and Geo-Hazards Risk Reduction Division of Ecological and Earth Sciences Natural Sciences Sector, 7 Place de Fontenoy, 75352 Paris 07 SP, France

¹³ Basque Coast UNESCO Global Geopark, Ifar kalea 3, Deba, 20820 Spain

¹⁴ National Research Institute for Earth Science and Disaster Resilience (NIED), Tennodai 3-1, Tsukuba 305-0006, Japan

¹⁵ UNESCO Chair on Geoparks, Sustainable Regional Development and Healthy Lifestyles, Department of Geology and Pole of the Geosciences Centre (CGeo), University of Trás-os-Montes e Alto Douro, 5000-801 Vila Real, Portugal

(Received: August 11, 2020; Revised accepted: February 3, 2021)

<https://doi.org/10.18814/epiugs/2021/021002>

The new challenges posed to UNESCO Global Geoparks (UGGps), resulting from the COVID-19 pandemic, require a guiding reflection and the presentation of a proposal for a roadmap, to be discussed and implemented in the short-medium term. The proposal presented in this work is the result of careful reflection and discussion among the authors, with the purpose of providing the UGGps with tools and lines of action that will allow them to face the new reality of the “World after”. These proposals are aligned with the new global dynamics, mainly with those that are seen as strategic for these territories. It is also based on the SDGs of the 2030 Agenda, with particular emphasis on Climate Action. The new reality must therefore also include a paradigm shift and a strengthening of networking activities, which should include a new dynamic of participation and sharing, appropriate to the more frequent use of tools for effective long-distance teamwork.

unified geographical areas where sites and landscapes of international geological significance are managed with a holistic concept of protection, education, and sustainable development. These territories use its geological heritage, in connection with all other aspects of the area’s natural and cultural heritage, to enhance awareness and understanding of key issues facing society” in the context of our dynamic Planet (UNESCO, 2019). For this reason, they have universally assumed the holistic integration of territorial values, in conjunction with all the UNESCO principles. In effect, currently, the UGGps focus the actions of their development strategy on the ‘Top 10 Focus Areas’: Natural Resources, Geological Hazards, Climate Change, Education, Science, Women and social responsibility, Sustainable Development, Local and Indigenous Knowledge, and Geoconservation (UNESCO, 2020b). This reality aims to re-connecting human society with the Planet, which we all call home, celebrating a long history of 4,600 million years. Bearing this in mind, the multiple commitments assumed by all those with responsibilities in the development and management of UGGps, are centered on a basic principle that these are “territories built with people and for people”. In this framework, and considering that the UGGps are established through a bottom-up process involving all relevant local and regional stakeholders and authorities in the area, in view of the current reality of the COVID-19 pandemic, it is necessary to discuss and implement, in the short-medium term, a new

Introduction

The UNESCO Global Geoparks (UGGps) correspond to “single,

roadmap for these territories. Aware of the challenges contained in this proposal, we intend to provide a broad base of work so that it can be adjusted generically to the different levels of governance of the UGGps and, more specifically, to the singularities of each territory. In this sense, bearing in mind that the UGGps are challenging and vibrant territories, mainly located in disadvantaged rural areas, we intend that all those with leadership, executive and technical responsibilities, view the new reality of “World after” post-COVID-19 as an opportunity to develop resilient activities and adjust priorities to indicators and targets of the Sustainable Development Goals of the 2030 Agenda.

Resilience in the “World after”

The new Global Geopark Network (GGN) initiative titled “*UNESCO Global Geoparks: territories of resilience*”, considering that resilience is the “act of rebounding”, was launched last 21st April 2020, in a moment when more than half of the world’s population was either still in lockdown or operating exit strategies to safely recover from this long and difficult COVID-19 period of restriction. This initiative, with a high semantic value, is intended to open inside the UNESCO Global Geoparks (UGGps) community new and complementary reflections and actions on the UGGps concept.

Resilience is a fundamental concept that is intrinsic to the UGGps. It is the capability of communities and territories to cope with significant adversity, like that we are facing in this COVID-19 pandemic moment (UNESCO, 2020c), but also in case of other hazards, like earthquakes, tsunamis, floods, landslides, volcanic eruptions, droughts, economic crisis, terrorism, conflicts, or migrant movement of refugees. For that reason, resilience is fully embedded in the institutional and management structure of UGGps (Dierickx et al., 2016; Fassoulas et al., 2018) as well as in any social, economic, educational and environmental dimension of their activities. In this sense, culture and local identity, geological heritage conservation, and social cohesion are fundamental keys to resilience in these territories.

A truly resilient territory does not only respond to disruption and crisis by trying to bring the system back into balance, but additionally endeavors to develop solutions that bring a system in a new state that is capable of dealing with present and future challenges.

In such an unexpected and dramatic moment, everywhere in the world appear voices from population, politics, philosophers and communities all of the world concur that there will be “a before and an after” (Goldin and Muggah, 2020).

A positive aspect of this tragic pandemic could be that a vast majority of the global population considers this outbreak, when the Earth has had chance to breath, as an opportunity to build a new world, different from the previous one. The “World after”.

It is highly probable that populations and nations will define new strategic priorities concerning mainly environmental conservation, actions to mitigate climate change, social justice, sustainable development, etc.

In that scenario, and with this constructive force picking up momentum, this sanitary crisis could be the start of a new world, different from the previous one. UNESCO Global Geoparks could be a driving force of this change towards the “World after”.

A multiple Goals Roadmap Proposal

The UNESCO Global Geoparks are the new territories of the 21st century, a reality that recognizes, expands and transforms them into territories of resilience. This different territorial concept and approach, based on a unique and active international networking, already demonstrated its crucial role in supporting the population’s resilience through this last pandemic itself, as well as in the past, when dramatic events like earthquakes, tsunamis, landslides, wildfires, *i.a.*, affected several UGGps (Dierickx et al., 2016; UNESCO, 2020c).

However, despite their indisputable success the UGGps, as well as their Global Geopark Network (GGN), must now consider some necessary adjustments in order to be fully able to participate coherently and effectively in this new “World after”.

Clarifying Some Concepts

The Geopark concept was created in the 1990’s, aiming to identify territories hosting significant geological heritage of international importance, which implement geoconservation and a holistic management of their natural and cultural resources and follow a sustainable development strategy for the benefit and development of the local communities (Mc Keever and Zouros, 2005; Martini and Zouros, 2008).

In 2004, the Global Geoparks Network came to be under the auspices of UNESCO, in order to support collaboration, exchange, and sharing of good practices, through networking among these territories, and to establish new Geoparks in all continents (Mc Keever and Zouros, 2005; Zouros, 2016, with references therein).

In the moment of the adoption of the International Geosciences and Geoparks Programme (IGGP) by the 193 Member States, during the 38th UNESCO General Assembly in November 2015, defined guidelines (UNESCO, 2015), constituted by eight articles were agreed for all UGGps.

The reality of the COVID-19 pandemic taught us a lesson and offers a window to draw the blueprint for a “World after” and the role UGGps will play therein. It is a moment to reflect on how we can explore and further develop the characteristics and strengths of UGGps that remained understated until now. With this document, we wish to set out these lines, in a clear, concrete and achievable manner, so that UGGps around the globe can integrate them, in time, in their daily functioning. We hope to provide as such inspiration for Geoparks that wish to build on the “World after”. We do not intend to deviate from the UGGp concept as it has been framed in the IGGP Statutes and guidelines, but some of the criteria that have been lightly considered in the UGGps procedures and actions, need an imperative clarification and emphasis.

In our view, the main themes concerned should be:

Climate Change

Climate change is an ongoing reality. The international agreements for climate action, particularly focusing on its mitigation, are core elements for the future of humankind on Earth.

It is the responsibility of each of us to take actions in order to contribute actively to the reduction of greenhouse gas emissions to limit global average temperature rise, and avoid extreme weather events

and rising seas, among others.

Taking actions to adapt to climate change will help to protect the health, wellbeing, and prosperity of communities whilst also assisting with the management of risks for heritage sites and ecosystems thus providing a new paradigm for healthy society. In this framework, UGGps are comprehensively aware of their responsibilities and the necessity for joint and concerted action regarding Climate Change mitigation. Some relevant UGGps initiatives and actions already exist but they need to be explained, diversified, shared, and replicated.

Several UGGps are already working in order to mitigate climate change impacts, and examples of good practices produced should serve as a stimulus and example to be followed by other territories of the network.

There is a need to improve education on this thematic, and UGGps need to be more active in this field.

In effect, UGGps can act as living laboratories to combat climate change and its impacts. This can be done by conserving geodiversity and biodiversity, protecting ecosystems and promoting ecosystem services, re-connecting landscapes with communities, capturing and storing carbon, decreasing the use of fossil fuels, invest in renewable energies, building knowledge on climate change and share this with visitors, students and the public at large, via guided tours, websites, school courses and other ways that help people understand and hopefully inspire them to action.

Water Resources

“It is well known that water is life... water also means livelihoods. It is the route out of poverty for individuals and communities. Managing water is essential if the world is to achieve sustainable development. This challenge is even more pressing as the world confronts the triple threats of climate change, rising food and energy costs, and the global economic crisis. All three are exacerbating poverty, inequality and underdevelopment.” Ki-moon (2009).

Water resources are both inherently linked with geology and are a clear component of the UN Sustainable Development Goals (SDG 6: Ensure availability and sustainable management of water and sanitation for all).

Water is central in the UGGps mission: “[...] to promote awareness ...the need for the sustainable use of Earth’s natural resources” – UGGp guidelines (ii) –.

However, several UGGps already collaborate with schools and stakeholders in order to develop and implement territorial actions in water resources education (reuse, minimum water consumption, etc.), in respect of their local community. In this context, it is important to consider the duty of territorial management structures to contribute with studies and data for regional and national entities to develop and approve laws in line with the sustainable use of water resources.

Marine Environments

We live on the blue planet, with oceans and seas covering more than 70% of the Earth’s surface. Oceans feed us, regulate our climate, and generate most of the oxygen we breathe. They also serve as the foundation for much of the world’s economy, supporting sectors from tourism to fisheries and to international shipping.

However, despite their importance, oceans are facing unprecedented threats because of human activities. Every year, an estimated eight million tons of plastic waste ends up in the world’s oceans. At the same time, climate change is damaging, *i.a.*, coral reefs and other key ecosystems; overfishing is threatening the stability of fish stocks; nutrient pollution is contributing to the creation of dead zones; and nearly 80% of the world’s wastewater is discharged without treatment (UN, 2020).

“If we are to fully benefit from the oceans, we must reverse the degradation of the marine environment due to pollution, overexploitation and acidification” (Ki-moon, 2013).

Marine environment is one of the important key issues of the “World after” and part of several SDGs (SDG 12, SDG 13, and SDG 14 and it is fully included in the UGGps guidelines – sustainable use of Earth’s natural resources (ii).

In spite the fact that 30% of existing UGGps have a maritime part, only some of them consider the marine environment as a full part of their heritage and responsibilities. Therefore, it is important that the UGGps concerned begin to consider their marine environment and integrate promotion and actions in this respect.

Sustainable Tourism / Sustainable Development

Sustainable economic development is in the core of UGGps concept and, probably, these are some of the best territories in the world to demonstrate clearly how it is important to establish and continually improve sustainable development strategies (Werlen et al., 2016; Henriques and Brilha, 2017; Rosado-González et al., 2020).

To enhance the UGGps actions in this field, it is necessary to avoid confusion by clarifying the concept of sustainable tourism and clearly explain why mass tourism is not sustainable as it was demonstrated, once again, during the COVID-19 breakout.

Tools and procedures need to be developed by management structures in order to develop and implement more efficient partnerships with small hotels, guesthouses, small and integrated tourism units, among others. These orientations are fundamental in order to avoid the destructive development of mass tourism, which is already problematic in many areas and has the potential to create difficulties anywhere across the world.

The promotion of local products constitutes an important part of sustainable development. It needs further clarification in order to be fully adopted by more and more UGGps. Explaining the important benefit that can be given by UGGps to some local products and demonstrating the full value of Geopark product branding, well-beyond the labeling, is an important and complex process that needs an overall strategy, with clear criteria, procedures, and commitments, and a solid monitoring system. For this also, tools need to be developed, shared, and implemented.

Visibility

Territorial sustainable development is not possible without a strong territorial identity and visibility. The UGGps visibility exists today often with a combination of several tools, advertising panels, entrance panels, information panels, partnership boards, etc., and is an important criterion for UGGps evaluation/revalidation.

It is essential that the information provided on onsite information panels is adequate and adapted to the public. In many sites, this is not the case, and they miss their function. Yet, all 147 UGGps taken together accumulate, roughly estimated 5,000 information panels, which represent globally a yearly maintenance cost of about 1 to 2 M€.

As it was suggested several times, these classic information panels could be substituted, as much as possible, by modern information tools (Martini and Zouros, 2008). These need to be more efficient, less expensive, and adapted to the public, with a simpler maintenance, yet providing a better visibility for the UGGps. In this sense, GGN and UGGps alike need to organize brainstorming sessions as soon as possible on this topic, including about procedures, tools, apps and other options that could be explored.

Indigenous Populations

It is important to remember that of the eight UGGp criteria, two of them (ii and v) refers directly to indigenous people: “empowerment of indigenous peoples” (in criteria ii), and “UGGp should involve [...] indigenous peoples as key stakeholders in the Geopark [...] Local and indigenous knowledge, practice and management systems should be included, alongside science, in the planning and management of the area” (in criteria v).

The current reality shows that the UGGps community has a strong chance to have an increasing number of territories in developing countries with indigenous population. In some parts of the world, some UGGps have a population with a high diversity of ethnic groups (*e.g.*, Dong Van UGGp, Vietnam, with 17 different ethnic groups in an area of 2,300 km²).

Probably because the majority of these UGGps only have geoscientists of non-indigenous origin in their scientific committees, and a possible lack of anthropological knowledge, an important majority of the management structures of UGGps develop very few actions aimed at integrating and involving indigenous peoples. Nevertheless, when it happens, it is often in a non-inclusive and therefore inappropriate way. These initiatives, which are carried out with good intentions, are often anecdotal, or increase the risk of folklorization, which contributes, on the contrary, to the disappearance of this indigenous culture, which is supposed to be protected.

To improve the indigenous people economy and livelihood, while maintaining their culture, tradition and local wisdom, the promotion and understanding of this topic among UGGps management structures needs to be done urgently. This must include specific training courses and the development of management tools. A professional and safe way is necessary, in order to preserve and highlight the importance and relevance of the indigenous populations and their knowledge.

Consistent Understanding Across All UGGps

To develop and operate UGGps consistently all over the world, it is necessary that the UGGp concept should be properly understood not only by managers and accountable, but also by the local population. For this reason, it is fundamental to adopt the correct translation of the word “Geopark” in each national language and adapt it to the context.

In Latin-Greek origin languages with a usual adapted understanding of radical ‘Geo’, which refers to the goddess ‘Gaia’, the Mother Earth.

The concept of Mother Earth is easily understandable and can find some concrete cultural interpretation like, for example, in South America, where the concept is easily understood as “Pachamama Park” stemming from the Incan mythology. Pachamama is the goddess Mother Earth, revered by the indigenous peoples of the Andes.

Depending the translation of “Geopark” into different languages, strong and problematic interpretations for the term “Geopark” exist in different non-Latin-Greek root languages. For example, in Vietnamese (Tiếng Việt), an Austroasiatic language, in which the designation “Geopark” is taken as “Công viên địa chất”, a word composed of công viên (Park) + địa chất (Geology), being interpreted as a “geological park”. From 2020 onwards, the Vietnamese Geoparks Network has decided to revise this and they adopted a translation that will be equivalent to “Earth Park”.

In turn in Iran, the adopted translation of Geopark is زمین (Zarmin = Earth) پارک (Park). However, in China, despite many conversations and exchanges with the Chinese UGGps colleagues, the “Geopark” translation is still 地質 (Geology) 公園 (Park). So, with 38 UGGps in China, that collectively receive more than 40 million of yearly visitors, this issue of lack of clarity needs to be considered.

Additionally, non-adapted and unsuitable translations create complex confusion during international conferences and prevent the population and local leaders from understanding the real philosophy. This in itself endangers all UGGps and therefore it is essential that messaging and understanding of UGGps must be clear and consistent to ensure the strength and coherence of all advances collectively.

Results and Discussion

UGGps already make a natural contribution towards climate change knowledge and mitigation. Besides that, Geoparks preserve clean water and air. However, the most relevant activities of the UGGps in this topic are directly related with the protection and conservation of the geological heritage and by that, preservation and promotion of the study of the memory of past climate changes, which are key elements for the understanding of the consequences of the current Climate Change.

UGGps also contribute to protect and conserve biodiversity and natural heritage maintaining biodiversity and keeping ecosystems strong and resilient.

In this line of approach, UGGps are natural laboratories where scientists can monitor environment and provide a significant global picture of Climate Change. For its part, indigenous populations inside these territories give us, with their priceless traditional knowledge, a complementary vision related with Climate Change reality. With this, the UGGps, which have an active voice through GGN's national and international networks, can share experiences, activities and best practices. In this way, they can effectively contribute to greater adaptation and resilience to Climate Change, in a respected and valued manner. In this framework, it is here proposed a “Roadmap on Climate Change”, which includes the following basic and easy realizable actions.

Raising General Community Awareness on Climate Change

By raising community awareness, UGGps should make information about Climate Change more widely available. Many actions can

be easily developed and implemented by UGGps management structures. This can be achieved, for example, by developing specific educational programs for schools and the general population, regarding the multiple issues behind Climate Change. Special activities (*i.e.*, exhibitions, talks, workshops, exhibitions) could and should be organized for the general public, promoting UGGps as territories of resilience in Climate Change. These initiatives must consider the relevance for their own area, as well as the wider issues that affect us all and require collective understanding, commitment, and change.

Encourage Population's Actions on Waste Management and Recycling Material Use

Also useful for community awareness such actions, where not already done so, need to be permanently organized inside UGGps villages and sites, focusing immediately on collecting waste and combating plastic pollution. Implementing also, as much as possible, waste recycling and promoting inside the UGGps partners the use of recycled materials in their activities (paper bags and containers, bamboo straws, etc.). UGGps strong participation inside specific UN International days as “World Clean-up Day” on the 19th September should be strongly encouraged.

Analyze UGGps Energy Use

As much as possible, UGGps should support development of clean and renewable energy. New ways of thinking and actions should be encouraged to implement, and where possible, introduce energy efficiency into existing and most certainly into new UGGps buildings and infrastructure (Museums, Info centers) and support/promote the development of greening transportation (electrical vehicles, charging stations, etc.).

Evolving the Network's Operation

For 20 years, one of the greatest strength and innovation of Geoparks has been in its exceptional network activity that, alone, has enabled an immense knowledge transfer and a rapid evolution and implementation worldwide. Networking exchange and field meetings are absolutely necessary for the evolution of quality within UGGps and for the adapted analysis of the appropriateness of strategies with the territories reality.

The success and enthusiasm sparked by the UGGps has led in recent years to an exponential multiplication of large-scale international meetings, workshops, intensive courses, and conferences. Sometimes the experts in this network have to fly 40 hours to stay sometimes less than 24 hours in the inviting territory.

Therefore, to participate in setting up a different “World after”, the GGN needs to be exemplary and mark the way for all its members. As such, this requires a necessary adaptation of its network functioning through opening of collective reflections, consideration and joined decisions concerning, amongst others, the carbon footprint generated by its activities.

GGN Activities vs. Carbon Footprint

Many observers and politicians are saying at this moment that travel

will never be the same as before the COVID-19 outbreak. People have involuntarily been trained in how to work from home, using dedicated technologies for meetings, lectures and talks. At this time of need, this new reality has changed their perception of business travel from “absolutely necessary” to “optional”. We have to draw a lesson from this and reflect on how much air travel is effectively necessary.

Adoption of a GGN Carbon Offset Policy and Procedure

A carbon offsets policy seems urgently necessary and needs to trigger a GGN Environmental Responsibility Commitment. In this new context, GGN needs to reaffirm that it is an environmentally responsible organization by considering the consequences of its decisions, policies, and actions on ecosystems and to minimize negative consequences. GGN should mitigate its overall carbon footprint and considering this an offsetting system.

This carbon-offset policy should be fully reflected within complementary rules for the organization of GGN related activities. This should concern the organization of GGN meetings, regional networks meetings, intensive courses, workshops, revalidation and validation missions, amongst others.

Collect and use of Carbon Offsetting

When considering this matter a wealth of possibilities exist. As an example, in order to stimulate future GGN brainstorming and discussions, here we present the following possibilities:

- Estimate for each person/travel carbon footprint related with UGGps activities, using one of the internationally recognized carbon calculators selected by IUCN (2008), being one of the most accurate the CO₂ calculator available on the Myclimate website;
- Adopt an offsetting value per ton of CO₂. For example, 12€/ton CO₂ could be applicable;
- The adapted quantity is collected by organizers and transferred to GGN on a special account named “GGN Carbon Offsetting”. On the basis proposed above, a simulation based on an offsetting done for all participants in each GGN Regional annual meeting plus all yearly validation and revalidation missions, shows that between 10,000 € and 15,000 € can be collected each year, as result of GGN carbon offsetting;
- Considering that a common carbon offsetting is often realized by planting trees in areas in need of reforestation and on an average base of 2 €/tree with an average of 1,500 trees/hectare, the “GGN Carbon Offsetting” could permit planting 6,000 trees on four hectares on an annual basis.

On this hypothesis, it is relevant and symbolic to develop a GGN global project that will be called “Global Geoparks Network Forest for the Future”. Through this, after an open call, the UGGps in need of reforestation and with adapted capacities could apply to receive the “GGN Carbon Offsetting funding” and could plant their own 10 hectares “GGN Forest”.

In time, there could be several “GGN Forest” around the world, providing not only reforestation and carbon offsetting but also new UGGps sites where it can be explained what is the GGN, UGGps, issues related with Climate Change, etc.

Development of New GGN Digital Tools

In order to support the clarification and reinforcement of the UGGPs concept, it is necessary that each UGGP can learn about the themes mentioned above, and that they dispose the adapted tools and examples to do so.

Very often UGGPs teams as well as local education system face difficulties to implement actions regarding concepts that are not directly related with the geological heritage, particularly in developing countries and generally in deep rural areas. This situation, unfortunately, is often due to the exclusive or predominant presence of geoscientists without this broader vision held in the UGGPs advisory boards' level or during the UGGP creation process.

To reach the goals presented above in a limited time, the creation of new tools is imperative.

Creation of GGN Digital Platform for Web-meetings

It is important that GGN could source, test and contract a digital platform that would allow it, as well as its regional networks and its working groups to organize successful digital meetings.

Without reducing the necessary face-to-face yearly meetings of GGN Regional Networks, this tool would provide the opportunity to bring all groups together more often during the year and by that would act to support all to gain in efficiency, initiatives, production and creation.

Creation of the Geoparks Educational e-Library

This e-Library could be easily constituted by:

- The pooling and selection of documents from the huge digital documentary databases of UNESCO and from relevant United Nations agencies;

- The pooling and selection of documents from the digital documentary databases of GGN and Regional networks (EGN, APGN, GeoLAC);

- Case studies and tools created by UGGP. These data could be collected in the same predefined format;

Creation of the Geoparks e-Learning Database

This database should be easily composed by a compilation of one-hour videos, made by the different GGN experts involved in the existing intensive courses. Such recorded video conferences/lectures could be, after a due editing process and peer review, made available to territories wishing to organize workshops supported by GGN. With the active participation of the GGN Members, an operative base of these tools could be made in a short term. Maybe this necessity of new tools could help to reconsider the real efficiency of some of the multiples GGN "working groups" and redirect some of their members inside new "digital working group" in charge of data recuperation and compilation in the predefined thematic.

Final Remarks

This multiple-goal roadmap proposal aims to realign the UGGPs

current management practices to cope with future uncertainties. The focus of the realignment should not be only on the development of infrastructures for heritage conservation and geotourism products, but more importantly, on the development of the critical needs for societal resiliency towards various risk impacts such as climate change, pandemics, geological or technological hazards. In addition, public education for understanding the need for environmental services needs to be improved in order to achieve sustainable livelihood, which must be the core foundation of the plan.

Acknowledgments

We warmly thank the referees of this manuscript, Dr. Maria Helena Henriques (University of Coimbra, Portugal) and Dr. Charalampos Fassoulas (University of Crete, Greece) for their constructive comments and suggestions, which helped to improve it.

References

- Dierickx, F., Pavlova, I., and Gaines, S., 2016, Natural Hazards in UNESCO Global Geoparks, *European Geoparks Magazine*, v. 13, pp.16-17.
- Fassoulas, C., Watanabe, M., Pavlova, I., Amorfini, A., Dellarole, E., and Dierickx F., 2018, UNESCO Global Geoparks: living laboratories to mitigate natural induced disasters and strengthen communities' resilience. In Antronico, L., and Marincioni, F. (Eds.), *Natural Hazards and Disaster Risk Reduction Policies, Geographies of the Anthropocene Series Books*, Il Sileno Edizioni, Rende, pp. 175–197.
- Goldin, I., and Muggah, R., 2020, The world before this coronavirus and after cannot be the same. <https://theconversation.com/the-world-before-this-coronavirus-and-after-cannot-be-the-same-134905> [accessed 27th June 2020].
- Henriques, M. H., and Brilha, J., 2017, UNESCO Global Geoparks: a strategy towards global understanding and sustainability, *Episodes*, v. 40, pp. 349–355.
- IUCN, 2008, Carbon Offset Policy and Procedures. https://www.iucn.org/downloads/iucn_carbon_offset_policy_and_procedures.pdf [accessed 27th June 2020].
- Ki-moon, B., 2009, Foreword, *Water in a changing world: the United Nations World Water Development Report 3*, 429 p. Available on-line <https://unesdoc.unesco.org/ark:/48223/pf0000181993.page=7> [accessed 27th June 2020].
- Ki-moon, B., 2013, Secretary-General's Message on World Oceans Day. <https://www.un.org/sg/en/content/sg/statement/2013-06-08/secretary-generals-message-world-oceans-day> [accessed 27th June 2020].
- Martini, G., and Zouros, N., 2008, Geoparks, a vision of the future. *Geosciences*, v. 7-8, pp. 182–189.
- Mc Keever, P.J., and Zouros, N., 2005, Geoparks: celebrating Earth Heritage, sustaining local communities. *Episodes*, v. 28, pp. 274–278.
- Rosado-González, E. M., Sá, A. A., and Palacio-Prieto, J. L., 2020, UNESCO Global Geoparks in Latin America and the Caribbean, and Their Contribution to Agenda 2030 Sustainable Development Goals. *Geoheritage*, v. 12, pp. 36.
- UN, 2020, Why do oceans and seas matter? <https://www.unenvironment.org/explore-topics/oceans-seas/why-do-oceans-and-seas-matter> [accessed 27th June 2020].
- UNESCO, 2015, UNESCO Global Geoparks Operational Guidelines. http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/SC/pdf/IGGP_UGG_Statutes_Guidelines_EN.pdf [accessed 27th June 2020].
- UNESCO, 2019, UNESCO Global Geoparks. <http://www.unesco.org/new/en/natural-sciences/environment/earth-sciences/unesco-global-geoparks/>

frequently-asked-questions/what-is-a-unesco-global-geopark/ [accessed 27th June 2020].

UNESCO, 2020a, International Mother Earth Day 50th anniversary. <https://en.unesco.org/news/international-mother-earth-day-2020> [accessed 27th June 2020].

UNESCO, 2020b, Top 10 Focus Areas of UNESCO Global Geoparks. <http://www.unesco.org/new/en/natural-sciences/environment/earth-sciences/unesco-global-geoparks/top-10-focus-areas> [accessed 1st December 2020].

UNESCO, 2020c, UNESCO Global Geoparks continue supporting com-

munities during COVID-19 pandemic. https://en.unesco.org/news/unesco-global-geoparks-continue-supporting-communities-during-COVID-19-pandemic?fbclid=IwAR2Q4GK4_VRkqCHwVzTIEen1-1KTeQCoWQ6fJ-APvIc4NXXRcsesatVKPPs [accessed 27th June 2020].

Werlen, B., Oosterbeek, L., and Henriques, M.H., 2016, 2016 International Year of Global Understanding: building bridges between global thinking and local actions. *Episodes*, v. 39, pp. 604–611.

Zouros, N., 2016, Global Geoparks Network and the new UNESCO Global Geoparks Programme. *Bulletin of the Geological Society of Greece*, v. 50, pp. 284–292.



Guy Martini is a geologist and has a background in anthropology. In the 1980s was one of the founders of the international movement for conservation in the Earth Sciences. He was the President of the French Network of National Geological Reserves (1985-1995), and was at the origin of the “International Declaration of the right of the Earth’s Memory” (1991). In the history and evolution of UNESCO Global Geoparks’ development, he is one of the main founding members. He is today the General Secretary of the Global Geoparks Network and chairperson of the UNESCO Global Geoparks Council.



Artur A. Sá is Associate Professor (Geodynamics) with tenure and Dean of the School of Life and Environmental Sciences of the University of Trás-os-Montes e Alto Douro, Portugal. Chair Holder of the UNESCO Chair on “Geoparks, Sustainable Regional Development and Healthy Lifestyles” and President of the Portuguese National Committee of the International Geosciences Programme (IGCP). He is also the Scientific Coordinator of the Arouca UNESCO Global Geopark and senior member of the Roster of Evaluators for UNESCO Global Geoparks.



Nickolas Zouros is Professor of Physical Geography, Geomorphology, Geotectonics and Geodynamics at the Department of Geography at the Aegean University, Greece. Chair Holder of the UNESCO Chair on Geoparks and the sustainable development of insular and coastal areas. Director of the Natural History Museum of the Lesvos Petrified Forest, since 1995, is responsible for research and conservation in the Lesvos Petrified Forest. He is the manager of the Lesvos Island UNESCO Global Geopark. He is one of the founders of the European Geoparks Network in 2000 and President of the Global Geoparks Network since 2014.