IECG 2020

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Conference Proceedings Paper

Promoting the co-creation of knowledge under physical distancing conditions through the participation of youth in the Bunaken-Tangkoko-Minahasa Biosphere Reserve (North Sulawesi, Indonesia).

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Published: date
Academic Editor: name

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Abstract:

The Biosphere Reserves are laboratories of sustainability that provide local solutions to global challenges. They promote research, education and the creation of communities of practice that jointly generate knowledge that may be applicable in decision-making. The context of global COVID-19 pandemic posed a great challenge to all teaching and learning processes and so to the co-creation of knowledge. In response, we developed an online teaching environment (webinar) to enhance the value of ecosystems and analyze the perception of youth, a key interest group in participatory governance of the territory, in relation to the provision of ecosystem services in the Biosphere Reserve in Indonesia. We took the experience of the Project "Ecosystem Services Assesment of the Basque Country" as a reference and developed a questionnaire on the perception of the provision of local ecosystem services. Our results contribute to establish a baseline to understand the relationship of youth with the territory and to set up an international scientific cooperation. This experience showed that the promotion of online solutions can help counteract the global pandemic negative effects on teaching and learning processes and also empower local actors in shared local management in the territory.

Keywords: Community of Practice; Webinar; Scientific Cooperation; Biosphere Reserve; Ecosystem Services.

1. Introduction

In this hyperconnected global era, new technologies are showing the interconnectivities at all levels (the effects of local activities to global level as well as between the different socio-ecosystems) and are offering novel tools for addressing new challenges. The 2030 Agenda for Sustainable Development encompasses these new challenges. The Sustainable Development Goals (SDG) represent a comprehensive framework that seeks to "leave no one behind" through working with and for all people. One of the recommendations identified is "implementing mechanisms that empower and actively encourage the participation of all in relevant decision-making processes, including in environmental matters, and ensure the respect, protection and fulfilment of human rights" [1]. The complexity of its practical implementation is often insufficiently acknowledged.

Diseases like COVID-19 pandemic abruptly proved the human dependence on nature and ecosystems unbalance equilibrium [2, 3] and it has affected multiple dimensions of human well-being. For instance, global financial shocks is increasing fuel and food prices that even compromise other sectors such as major incomes related to tourism in deprived areas and education of quality. COVID-19 pandemic has had negative consequences on all programmes and activities. This situation is showing the interconnection among all life on this planet and the development of alternative teaching environments counteranting the physical distancing conditions is essential. Despite the fact that nature can be seen as a pathogenic reservoir, we are trying to demonstrate the positive contribution of the nature to human well-being (*e.g.* Ecosystem services) .The development of online teaching opportunities are essential to connect local communities to these global effects.

In addition, the preservation of biodiversity underpins the enhancement of resilient communities and safeguard the prosperity of humanity. For instance, the loss of biodiversity reduces ecosystems healthy flows and increases vulnerability to threats including negative impacts of climate change and thus undermines the ecosystem services that promote the sustainability of life and human well-being. [4, 5].

Sustainable development is a complex notion and polysemic because encompasses different elements. The Brundtland definition thus evokes the need to find balances to ensure: "compromise between the interests of present and future generations; compromise between the priorities of industrialized countries and those of developing countries; compromise between quality of life and preservation of ecosystems " [6] as well as between different social and economic groups in the same community. It is also giving room for different interpretations that each group of actors follow.

The MAB Programme started in 1971 at UNESCO as "a long-term intergovernmental and interdisciplinary programme on the Man and the Biosphere (MAB) [7]. Actually, the effort of the MAB Programme is focused on the Biosphere Reserves as "Science for Sustainability support sites" – special places for testing interdisciplinary approaches to understanding and managing changes and interactions between social and ecological systems, including conflict prevention and management of biodiversity [8].

Biosphere Reserves are places that provide local solutions to global challenges by fostering conservation outside "traditional protected areas" and are sustainably used. In addition, the programme develops activities to share experiences between sites and to promote research, environmental education or training activities, within the World Network of Biosphere Reserves, to support cooperative decision through the participation of local communities and interest groups in landscape planning. Each site sets up a appropriate zoning system (core, buffer and transition zones) to reach three functions: conservation, sustainable development and logistic support. The logistic support function includes demonstration projects, environmental education and training, research and monitoring related to local, regional, national and global issues of conservation and sustainable development [9].

The World Network of Biosphere Reserve now is composed by 714 biosphere reserves in 129 countries. The decision body of the MAB programme (International Co-ordinating Council of Man and the Biosphere Programme (MAB-ICC)) recognized 25 new sites during its online meeting held from 27 to 28 October 2020 [10], in: Andorra, Benin, Cabo Verde, Comoros, Greece, India, Indonesia,

Kazakhstan, Luxembourg, Maldives, Mongolia, Nigeria, Peru, Portugal, Russian Federation, Rwanda, Trinidad and Tobago. Indonesia received the recognition of three new biosphere reserves, one of them Bunaken-Tangkogo-Minahasa Biosphere Reserve, located in the North Sulawesi Province.

This new site is contributing to the conservation of different landscapes, ecosystems, species and genetic variation. It is part of the hotspot of biodiveristy Wallacean with a high level of endemism. The Biosphere Reserve zoning system is articulated around five different protected areas as core zones, from marine and coastal until mountain and forest ecosystms [11]. This Indonesian Biosphere Reserve has a superficy of 746,412.54 ha. This superficy is similar to the Basque Country part with a superficy of 723,400 ha that includes as well Urdaibai Biosphere Reserve (Bizkaia).

This scientific cooperation between this two areas is included in the UNESCO World Network of Biosphere Reserves, with the general objective to promote the creation of a community of practice that jointly generates knowledge with the goal to guide decision-making processes for the Biospheres Reserves. The UNESCO Chair on Sustainable Development and Environmental Education of the University of the Basque Country (UPV/EHU) developed it in the Basque Country region [12].

The research project "Ecosystem Services Assessment of the Basque Country" developed in the Basque Country (Spain) the conceptual and methodological framework of the International Scientific Programme Millenium Ecosystem Assessment. The generated scientific knowledge highlighted the consequences of the changes in ecosystems and their services and it aims to be a tool for the identification of priority actions designed to avoid or minimize these human impacts. Moreover, it enhances its application in the public and private sectors by means of a community of practice [11]. The experience of the Project "Ecosystem Services Assesment of the Basque Country" of the UNESCO Chair from UPV/EHU was taken as a reference, in which a transdisciplinary community of practice was promoted to apply the approach of ecosystem services in spatial planning [12].

The "community of practice" is defined as a group of people with a common interest, with the aim to co-generate and to co-manage knowledge and integrate it among all stakeholders. Special attention must be drawn to the importance of establishing a constructive and mutually comprehensible dialogue between all of them. The transdisciplinary community of practice involved politicians, technical experts and scientists [12].

It can be replicated as:

- a tool for the identification of priorities and actions to avoid or minimize human impacts on ecosystems and their services;
- a tool for highlighting the policies and actions that impact positively on the conservation of natural capital;
- a tool for the promotion of participatory approach with the university support.

The present experience in Indonesia is aimed at providing tools to analyze the perception of the youth in relation to the provision of ecosystem services in the new Biosphere Reserve in Indonesia. It pursues as wellto let them become local actors of changes in this global world and to include them in the governance of their territory. This works applied the co-creation of knowledge and the set up of a community of practice approach to promote inclusive participatory management of their territory. It is based on previous experience of the Project "Ecosystem Services Assesment of the Basque Country" from the UNESCO Chair on Sustainable Development and Environmental Education of the University of the Basque Country (UPV/EHU).

2. Methods

The experience in Indonesia was developed within the framework of an online training untitled "E-LifeLong Learning Project", funded by UNESCO. It was conceived to foster new forums to promote local leadership through the incorporation of the youth vision in the future

decision-making structure of the Biosphere Reserve. In this sens, this "E-LifeLong Learning" webinar and subsequent similar activities, integrated policy makers, research and civic society presentations to share their vision. It has beenalso spreading the activities through publications, seminar and audiovisual materials.

As sustainable development should be guided by scientific knowledge, social agreements and political decisions, there is need for the co-creation of knowledge. In addition, in collaboration with the University Sam Ratulangi (Manado, Indonesia) and the Indonesian MAB National Committee, The Indonesian Institute of Sciences (LIPI), a scientific basis was provided to interpretate the vision of the ecosystem-based approach and strengthen the relationship between people and the nature.

The information was collected mainly through the E-lifelong Learning for Youth webinar, held on 12 August 2020. Two sources of information were analyzed, to understand the vision of youth from the Biosphere Reserve:

- The pre-questionnaires of the participants to the Webinar. This questionnaire was necessary to be completed before receiving the code access for the seminar
- A questionnaire that was presented during the seminar about the perception of the ecosystem services contribution in relation to each socio-ecosystem ("environmental unit") within the Bunaken-Tangkoko-Minahasa Biosphere Reserve.

A total of 74 people completed the pre-questionnaire. It was composed by 29 questions for characterizing the sample population, their relationship with nature, their vision and their level of environmental activism as well as information on how they knew about the E-Lifelong Learning webinar.

A second questionnaire was developed on the perception of the provision of ecosystem services on a semi-quantitative scale (minimum 0, maximum 5). It was structured around three blocks of services (provision, regulation, cultural[11]), disaggregated by 20 services and in relation to 12 environmental units present in the Bunaken-Tangkoko-Minahasa Biosphere Reserve.

A total of 75 perception questionnaires (n = 17 760 records) were collected from students of two faculties of UNSRAT (Faculty of Agriculture and Faculty of Fisheries and Marine Science) and analyzed using general linear models [11].

3. Results and Discussion

The partial analysis of the pre-questionnaire tries to understand the perception of the respondants, in particular their favorite places (maximum three choices). A great majority (80 %) chose mountain/forest and coastal area astheir favorite places. Places associated with water such as waterfalls were also important places frequently mentioned. 178 different locations were taken into account (Figure 1).

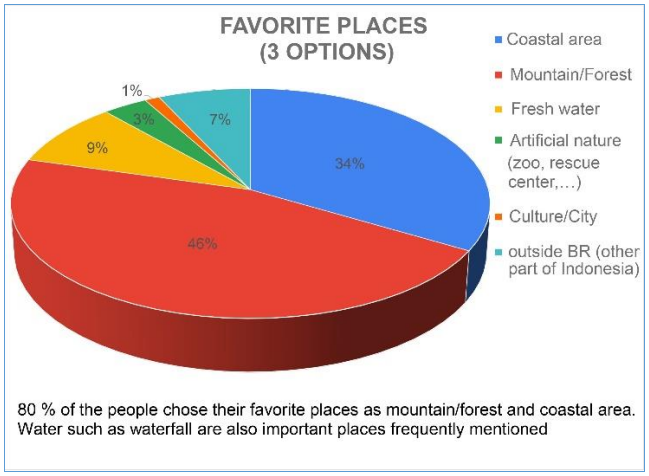
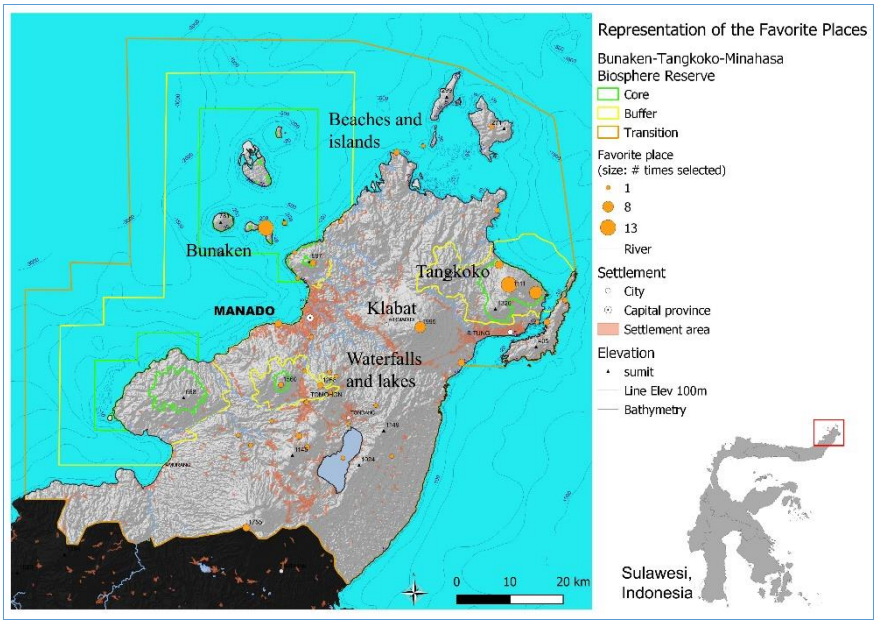


Figure 1. Respondents favorite places in the Bunaken-Tangkoko-Minahasa Biosphere Reserve

Two types of information was provided. The first one was about generic locations or types of places such as beaches, mountains, waterfalls, etc. The second one was dealing with specific places(e.g. Klabat mountain, Bunaken National Park of a specific island of the park, etc). The specific place has 119 sites, 12 outside the Biosphere Reserve (68% of the places are specific location). The 107 specific locations are represented in the map below (map 1).



Fugure 2. Favorite places and the zoning system of the Bunaken-Tangkoko-Minahasa Biosphere Reserve (BR) (limite of the BR extacted from nomination dossier – created by the authors).

Two areas are the most representative: Bunaken Marine National Park and Tangkoko Conservation Forest Management Unit (KPHK). KPHK is composed by three protected areas: Dua Saudara volcano Nature Reserve, and two Nature recreation Park (Batu Putih and Batu Angus)). The mountain Klabat is also very frequently mentioned. It is the higher peak in the area (1,995 m). The Tomohon area has a large number of waterfalls, lakes (*e.g.*Linow or Tondano) and hills. It represents also an attractive area mentioned by the participants. Some specific beaches and islands (*e.g.* Bangka, Lembeh) were also mentioned.

The second analysis is concerning the perception of the contribution of the ecosystem services by each environmental unit and its differences between the two UNSRAT faculties. The results of this evaluation of the questionnaires are shown in Table 1.

The block of ecosystem services that received the highest average evaluation was the one corresponding to "cultural services" group (average scored 3.06), in particular "scientific knowledge" service. The most valued environmental unit corresponds to "primary and secondary forest" (average scored 3.94). The disaggregation by each services group shows that "food supply", "regulation of air quality" and "scientific knowledge" were the most valued respectively within provision, regulation and cultural services groups (Table 1).

On the other hand, there are significant differences ($p<0.05$) between both faculties' students perception. Both faculties agreed on the importance of "food" as well as "scientific knowledge". However, in the regulating services group, "water regulation" is the most important for the Faculty of Agriculture students and "regulation of air quality" for the Faculty of Fisheries and Marine Sciences. Concerning the environmental unit, forest ecosystem is rated as very important in both faculties. However, The Faculty of Fisheries and Marine Sciences is also scoring coastal and sea with a high value (median and mode).

Group / Faculty	ITEM	mean	median	mode	SD
	ECOSYSTEM SERVICE				
	PROVISIONING	2.93	3	3	1.58
Global*	food	3.17	4	5	1.70
Fish & Marine Sc.	food	3.15	4	5	1.84
Agriculture	food	3.20	3	3	1.53
	REGULATING	2.93	3	3	1.49
Global*	regulation of air quality	3.24	3	3	1.32
Global*	water regulation	3.22	3	4	1.45
Global*	maintenance of soil fertility	3.20	3	4	1.44
Fish & Marine Sc.	regulation of air quality	3.34	3	3	1.36
Agriculture	water regulation	3.30	3	4	1.37
	CULTURAL	3.06	3	4	1.44
Global*	scientific knowledge	3.32	3.5	4	1.33
Global*	environmental education	3.25	4	4	1.40
Fish & Marine Sc.	scientific knowledge	3.22	3	4	1.38
Agriculture	scientific knowledge	3.42	4	4	1.27
	ENVIRONMENTAL UNIT				
Global*	Pri. & Sec. Forest	3.94	4	5	1.16
Global*	Plantation & Garden	3.44	4	4	1.24
Global*	Coastal & Sea	3.40	4	5	1.43
Fish & Marine Sc.	Pri. & Sec. Forest	3.86	4	5	1.26
Fish & Marine Sc.	Coastal & Sea	3.65	4	5	1.33
Agriculture	Pri. & Sec. Forest	4.03	4	5	1.02

Table 1: Descriptive statistics of the evaluations obtained in the questionnaire (n = 35). ***Global:** Total of respondents for both faculties

The results obtained highlighted the importance of primary and secondary forest and they are in line with the Bunaken-Tangkoko-Minahasa Biosphere Reserve design. It underscores the youth's perception of the multifunctionality of forest ecosystems, which provide multiple benefits for the entire territory, with emphasis on the generation of knowledge and to supply food as well as hydrological and air regulation processes that can be addressed through a water cycle approach.

The results obtained are consistent with the nomination process of the Bunaken-Tangkoko-Minahasa Biosphere Reserve, which is based on the premise of providing innovative mechanisms that promote the generation of scientific knowledge that contribute to local and global sustainable development and its contributions to the World Network of Biosphere Reserves. It also remarked as well the interrelationships between all ecosystems and the pertinence of this integral Biosphere Reserve landscape spatial unit.

Our results contribute to establish a baseline to understand the relationship of youth with the territory within the framework of the MAB Programme and to set up an international scientific cooperation. In addition, the ecosystem services approach highlights the role of water cycle as a connector to facilitate climate change adaptation in the new Biosphere Reserve.

This opportunity for *in situ* research and testing of sustainable solutions revolves around primary and secondary forest. It may guide future lines of work aimed to reinforce the knowledge about the interrelationships of these ecosystems with other environmental units of the territory. It also may promote the enhanment of synergies between the real uses of the territory and the socioecological demand and its perception and support novel mechanisms to promote the co-creation of scientific knowledge that contribute to local communities development.

It should be noted that these general results have been collected through questionnaires distributed during the E-lifelong Learning online training to participants who have an interest in the environment and among students of the UNSRAT Faculties. Their experience and educational orientation may also has reinforced these conclusions. We can also conclude that inside of a same group ("students") there is also some variations and confirms the challenge to develop transdisciplinary research methods.

This type of work that focuses on young people highlights the key present and future role of youth in global sustainability processes, as well as in shared local management of this site, facilitated by UNESCO mandates to dynamize spaces in which their vision and participation are promoted.

For all these reasons, an experience such as the one that has been carried out, driven from the transfer of knowledge and supported by a joint co-creation, is promoting a multidisciplinary community of practice that support the relevant role of youth. It can be a very valuable tool for generate synergies and support joint management of spaces that promotes harmonious conservation and increase the resilience of local communities, including nature, health, economy and culture. the contributions can be extrapolated at the global agendas.

4. Conclusions

Our results validate the logistic support function of the Bunaken-Tangkoko-Minahasa Biosphere Reserve as a generating space for scientific knowledge that allows understanding and enhancing the vision of the youth. The results regarding the perception of ecosystem services encourage to develop integral landscape vision to embrace different ecosystems, the possibility to combine scientific approach (marine and terrestrial). The Biosphere Reserve is presented as a favorable space on which to combine biophysical and social information. Furthermore, this experience is encouraging the creation of a community of practice in which youth plays a prominent role in facilitating their leadership.

It is important to highlight the role of scientists in the management structure as a facilitator of solving problems and identify potential conflict based on perception analysis as well as support international cooperation and sharing experiences. By including people's perception in the analysis, the sense of belonging is being reinforced and the sentiment to contribute to other scales (other Biosphere Reserves, international agendas, etc).

Acknowledgments: The authors first thank UNESCO Jakarta Regional Office, that support Open Sciences, for their financial support to organize the webinar: "E-LifeLong Learning on Biosphere Reserve for Youth" and the webinar on Eco-Hydrology, and for their participation. It has been an important part to disseminate the contributions of this article and guidance in the development of these seminars. On the other hand, they also thank the Sam Ratulangi University, for its technical contribution and logistical support to motivate young people during the restrictions period of COVID-19 pandemic and to solve all administrative issues. In turn, we also thank the organizations involved in the management body of the Bunaken-Tangkoko-Minahsa Biosphere Reserve, in Indonesia: BTN Bunaken, BKSDA and BAPPEDA, as well as the NGOs and youth groups (*i.e.*: Ms Sukma Riverningtyas), the Indonesian MAB National Committee, LIPI and by extension to the seminar participants. We hope that these initiatives will support the foundations for a future Community of Practice in this region. Finally, this exchange work between universities is also promoted by the UNESCO Chair on Sustainable Development and Environmental Education of the UPV/EHU. This UNESCO Chair is promoting a Community of Practice in the Basque Country with the support of the local Basque Government, the Provincial Council of Bizkaia and all the local actors in this territory that are participating in.

Author Contributions: Alberto Hernandez-Salinas and María Viota conceived the idea and analyzed the data; Y. Purwanto, Johnny S. Tasirin, Gustaf Mamangkey and Fabiola B. Saroinsong performed the organization of the webinar and collected information; Miren Onaindia, Ibone Ametzaga, Lorena Peña, Beatriz Fernández and Jasone Unzueta provided methodology, guidance and university cooperation.

Conflicts of Interest: "The founding sponsors, UNESCO Jakarta, had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results".

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