

RISK ASSESSMENT AND STAKEHOLDERS MAPPING: ON THE WAY TOWARDS ADAPTIVE MANAGEMENT FOR YASUNÍ NATIONAL PARK

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Abstract: *Integrated in a wider attempt of analysing the socio-ecological systems, this study aims at making a risk assessment and stakeholder mapping of Yasuní National Park, one of the most megadiverse protected areas in the world, facing a huge range of challenges from oil drilling issues to the need for preserving ancient indigenous populations. As part of already consecrated MARISCO methodology implementation and based on bibliographical analysis and focus groups with members of Kichwa nationality and Park administration team, the results of the study indicate that unsustainable oil exploitation and deforestation for new agricultural land or oil drilling are the main risks not only from the perspective of governmental YNP administration representatives, but also, by the local Kichwa population. There are numerous entities interested in the natural resources management in YNP, starting with the national and local authorities and ending with local communities and different donor organisations. YNP is under the attention of numerous organisations and there is a clear interest of numerous entities from the civil society, universities, and research centres in finding the best management solutions for the future. For the local population, evolutions determined by numerous external factors and stakeholders, are, sometimes difficult to understand, follow and adapt.*

Key words: *Yasuní, risks, stakeholders, indigenous communities.*

1. Introduction

Ecosystems worldwide have undergone significant change over the last 50 years of

human history [21] and scientific evidence over the last 20 years has exposed the direct relationship and dependence of human well-being on the maintenance of

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natural systems [24]. The ecosystem changes are primarily associated with food production, freshwater needs, and the effects of fossil fuel use [21]. In turn, the impacts are evident in all ecosystems, modifying global biogeochemistry, driving climate variation and leading to the loss of biological biodiversity [27]. In this context, although protected areas (PA) establishment and management constitute the backbone of biodiversity conservation [11], the levels of complexity of environmental problems have prompted the search for solutions focused on adaptive management of PAs [24], that must include a better understanding of non-linear relationships affecting socioecological systems (SES) in which PAs are anchored [10].

Among numerous methods, adaptive Management of vulnerability and risk at conservation sites (MARISCO) [8] allows ecosystem analysis and adaptive planning to be based on ecosystem theory and science and risk management [8]. It is established on sustainability at its core and starts from a practical analysis of the causes and dynamics of ecosystem evolution, linking development, poverty, and social systems [8].

Ecuador is considered one of the 17 mega diverse countries in the world, having an impressive wealth of biological and cultural diversity [20]. It has the highest relative biodiversity [20], and the highest concentration of biodiversity per square kilometre due climatic, geological, evolutionary, biogeographical, geographical and ecological factors, such as the presence of the Andes Mountains, the Equatorial Line and the influence of ocean currents, and the Amazon basin [2], which facilitates the formation of different climatic floors and ecological landscapes

with very diverse ecosystems [18, 29]. Ecuador hosts 7.3% of vertebrate species and 7.6% of vascular plant species described worldwide [3], while the tropical Andes, in terms of vertebrate species, endemic vertebrates and endemic plants lead the list globally [25]. 79% of the existing plant formations in Ecuadorian territory are found in the National System of Protected Areas. While Ecuadorian PAs and are home to 26 indigenous nationalities [18]. The Ecuadorian state recognizes biodiversity as a competitive advantage and establishes as a priority area within national planning those sectors that depend directly on nature and its biological resources [18].

Despite the various strategies and initiatives implemented by the Ecuadorian government at the national level to develop sustainable natural resource management, the results are still emergent [19, 20]. Over the last few years, a clear need for replacing traditional approaches with system-based approaches, including spatial analysis, ecosystem diagnostic analysis, increased understanding of stresses, scenario planning and vulnerability in adaptive conservation management [8], thus creating opportunity for using MARISCO methodology.

Yasuní National Park (YNP) is a very important part of Ecuadorian National System of PA, being the largest protected area in continental Ecuador. Considering the very complex SES in YNP rising significant challenges as people-park and human – wildlife conflicts [15, 16], adapted management approach was adopted in analyzing the dynamics and relationships between the ecological and socio-economic systems. In this context,

MARISCO methodology was considered as the most appropriate.

The objective of this study is to make a major risks assessment and stakeholders mapping for YNP as part of describing the SES of YNP so that, in the future, a strategic planning based on sustainable adaptive management can be established.

2. Materials and Methods

2.1. MARISCO Approach

Adaptive management implies a systemic approach and an understanding of economic, ecological, social and evolutionary changes at local and global levels [7]. The MARISCO methodology was developed by Centre for Ecosystem Economics and Management of the Eberswalde University for Sustainable Development, being derived from the Conservation Measures Partnership's Open Standards for the Practice of Conservation, with an ecosystem-based, approach to risk management through systematic and strategic planning inside and outside protected areas [5, 7, 8]. MARISCO is a toolbox that focuses on ecosystem analysis and planning [8], its flexible and adaptable structure allows it to cope with constantly changing situations, i.e. it is able to evolve and adapt to new scenarios and vulnerable environments [9], because the connections in ecosystems can become unlimited [5]. The method has been successfully applied all over the world: Latin America, Central and Western Europe, Eastern and South-Eastern Europe, Africa, and Asia mainly in complex sociological, conservation planning studies, field of sustainable development and applied research [9]. In Ecuador this methodology has been applied in some

PAs such as: Área Ecológica de Conservación Municipal Siete Iglesias, Área Ecológica de Conservación Municipal Tinajillas-Río Gualaceño [7, 9] the main objectives being focused on establishing strategies that allow the adaptive and sustainable management of natural resources and improve the income of the surrounding communities [7, 9].

Among the conclusions obtained after the application of this methodology in different countries are: it does not require many resources for its application, it is applicable in all types of systems, at different scales, with all types of data, quantitative, qualitative, different areas of interest, it analyses all types of vulnerability and it is a methodology that is very well accepted by all actors as it is participatory, this enables participants to collaborate effectively from the beginning of the process until its completion, with full commitment and willingness, thus bringing tangible benefits [9]. MARISCO includes steps and activities involving spatial analysis, ecosystem diagnosis, risk assessment, planning, and vulnerability assessment for adaptive conservation management. It consists of a clear, systemic procedure, open to all audiences, and all types of information work for action and continuous learning [9], at the management level, including four major phases (Table 1).

2.2. Study Area

This study was carried out in YNP, located in the central-eastern sector of the Ecuadorian Amazon region, in the Orellana province, between the Napo and Curaray rivers (Figure 1) [16]. YNP was established as a National Park on July 26th, 1979.

Overview of the four major MARISCO phases(adapted) [8]

Table 1

Phase	Name	Objective	Comments
I	Preparation and initial conceptualisation	To conduct an Ecosystem Diagnostic Analysis (EDA) and complement it with other activities: stakeholder mapping, major risk assessment	This is the main object of the present study.
II	Systematic vulnerability analysis	To analyse the situation to establish a better understanding of the status of the conservation targets and identify existing and potential stresses, risks, threats.	These two phases of the MARISCO methodology were not included in the present study
III	Comprehensive evaluation, prioritisation and strategy formulation	To analyse existing strategies and generate new strategies to improve target functionality, reduce threats, vulnerability, and risk, and establish a monitoring plan.	
IV	Implementation and (non-) knowledge management	To implement the strategic plan, including knowledge management and evaluation of the implementation process.	

In 1989, YNP and its buffer zone were declared UNESCO Biosphere Reserve due to its biological and cultural value. Besides, in 1999, the Intangible Conservation Zone was established to protect the jungle ancestral cultures of the Amazon [15, 16]. Being the largest PA in continental Ecuador, the park occupies a unique location at the intersection of the Andes and the Amazon Basin [16]. YNP protects a large tract of the Napo Moist Forests terrestrial ecoregion and the Upper Amazon Piedmont freshwater ecoregion, which contains numerous headwater rivers of the Amazon. Yasuní is within the “Core Amazon,” a particularly

wet region with high annual rainfall and no severe dry season [1].

2.3. Data Collection and Analysis

According to the guidelines for MARISCO methodology [8, 23] the following steps were taken:

1. Focus Groups discussions with members of the local communities (June 2022): based on the spatial dynamic of the identified risks, vulnerable areas were selected and interviews with communities in these areas were organized. The main targeted ethnic group was Kichwa

nationality situated in the forests along the river Napo, at the edge of YNP. The decision to focus on *Kichwa* communities was influenced also by the fact that the organized affected ethnic group – the *Waorani* nationality – was very difficult to reach within the limited resources available for the project. *Aniangu*, *Sani*, *Pilchi* and *Indillama* communities were visited, and focus groups were organized with 5-10 participants. For these small communities, focus groups are the most recommended ways to record their perception, letting the participants feel relaxed and not trying to deliver answers that they consider

being desired by the researchers [8]. Participants were asked to discuss, among other issues, about the patterns of land use and land change, forest related benefits for the community, threats to their communities, activities related with risk adaptation, as well as activities and programmes institutions carry out in YNP. Discussions were documented by the first author and a qualitative analysis was done for major risk assessment identification and description as well as for identification of most important stakeholders that had interacted with the studied communities;

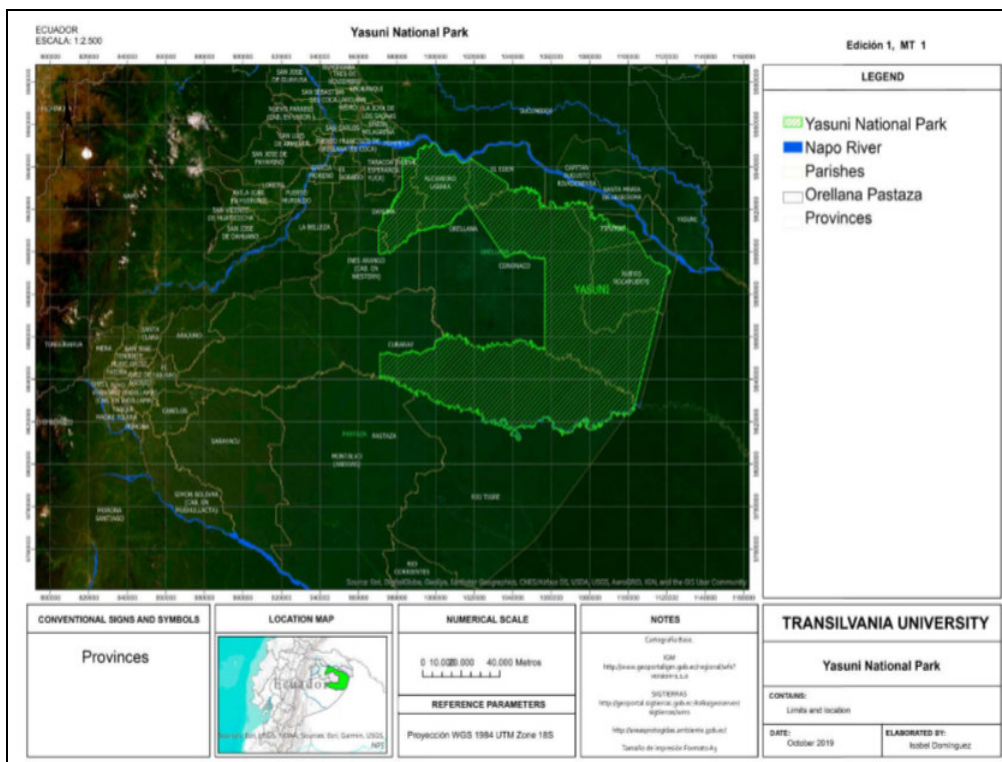


Fig. 1. Yasuní National Park

2. Filed visit (June 2022): bibliographical information found was verified and contrasted by means of field visits:

during field visits, the above local communities focus groups were organized;

3. Focus group with YNP management team (June 2022). At the end of the field visit, YNP management team was consulted regarding the preliminary results of the bibliographical study and discussions with local communities. 4 members of the park management team were asked to discuss about the most relevant threats to YNP conservation objectives as well as the most important programs, activities and the entities involved. The results of the focus group were documented by the first author and were used to complete the results of the study.

Following the field work, the information has been assessed and the results were elaborated: 1) as qualitative description for major risks, and 2) in the shape of a conceptual model and map for the stakeholders aiming at illustrating the relationships between them, too.

3. Results and Discussions

3.1. Major Risks Assessment

3.1.1. Oil Exploitation Patterns of Land Cover Change

The YNP is known as one of the most biodiverse places in the world. However, since its creation in 1979, it has had to face major socio-environmental problems, as it is also home to the largest oil reserve in Ecuador. This region is also the territory of ancestral peoples and nationalities, legally recognized in the Constitution of Ecuador as Ethnic Territory of the *Waorani* Nationality [16, 27]. Then in the 1980^s, oil exploitation began, focusing on the northeast forested territories of YNP [28]. Meanwhile, in 2007 a zone was delimited in order to protect the indigenous peoples living in voluntary isolation (*Tagaeri Taromenane*) - the Intangible Zone, where

extractive activities are prohibited, including oil exploitation [27]. From 2013 to the present, after the failure of the Yasuní ITT Initiative [4, 13], which was intended to leave the oil underground, oil activity has expanded to remote areas in the north-east of the park [28]. Oil drilling activity determined the development of the transportation infrastructure with uncontrolled effect on biodiversity [26] forest cover [14] and social dynamics of local indigenous groups [14, 26]. Contrary to some previous research [12], our findings revealed that many of the members of the *Kichwa* community (except for the *Idillama* community) have the tendency to avoid further contact with oil companies, considering that this is limiting the choices of the community and makes their families more dependent, while in difficult times (COVID pandemic was mentioned) the oil companies stopped offering job opportunities. However, for the *Indillama* community, much closer linked with oil companies, they are not seen as a risk but rather as an opportunity in reducing their dependency on the forest. Many of the *Kichwa* community members expressed their fear that job offers from oil drilling companies is very risky for them because they expose families to being too oil drilling dependent. Some of the participants specified that forest dependence of their family is preferable to taking oil drilling uncertain opportunities. The *Khicwa* community is known as pioneers in tourism in the area. They already have significant results and balanced the petroleum dependency not only through forest resources (e.g. logging) but also from tourism [26]. In terms of deforestation, the communities didn't consider it a very big risk, unless

deforestation is associated with colonists coming, in the buffer zone and settling for agricultural purposes (claiming the land) [28]. One important concern of the communities is their land rights and the fact that using their land for drilling purposes is not getting enough benefits for the communities [6]. YNP management team considers oil drilling as a major risk, although they consider that development of oil drilling areas is still under control.

3.1.2. Deforestation Patterns of Land Cover Change

According to satellite images and maps (www.maaproject.org), deforestation directly and indirectly associated with oil extraction is evident [28]. Significant surfaces have been deforested for access roads for oil infrastructure, besides within the controversial ITT Block, the construction of new roads and the construction of the platform can be observed [28]. In terms of indirect impact, different sources indicate there is a total of around 350 ha of deforestation due to agricultural activities (i.e. colonisation) along the oil road known as Maxxus, from 2017 until present days [22, 26, 28]. Same sources indicate a surface of deforestation directly and indirectly related to oil activity estimated to around 500 ha [28]. The analysed communities manifested special concerns regarding the colonisation: groups of people settling at the edge of YNP and claiming land for agricultural purposes. When comparing agricultural practices, members of the *Kichwa* communities underlined their itinerant type of agriculture, that, in their view, is not harming the forest due to less intensive agriculture and the fact that forests ecosystem is allowed to regain the

land after few years of usage. The colonisation is considered a major concern by the management team of the YNP, too, while also underlying that the regulatory framework, as well as the law enforcement capabilities of the governmental bodies in the territory are rather weak.

3.2. Relevant Stakeholders

The conclusion of the secondary data sources indicates that YNP is a complex territory with the participation of the following actors: local public authorities, government portfolios, control organizations, indigenous nationalities, country organizations, non-governmental organizations and private enterprises [16, 22]. All these factors have important roles and influence on forest ecosystems in YNP. However, the administration of the park, subordinated to the Ministry of Environment (ME) is the entity that should coordinates actions with the other actors (Figure 2) [17, 19]. In this context, the Directorate of Protected Areas, the Directorate of Forests, the Undersecretariat of Biodiversity, and other agencies belonging to the ME, maintain the responsibility and regulation of biodiversity conservation in PAs. In addition, it is the ME, through the Directorate of PA, who applies each of the legal and environmental regulations within PAs, and approves the management plan of the PA, following consensus with the direct stakeholders involved. Once the PA management plans have been approved, they are executed on a daily basis by the park administrator, park rangers and the technical team [17, 19]. Management programmes include conservation and management of natural

and cultural heritage, environmental education, control and surveillance, research and tourism [20]. Meanwhile, academic institutions such as the Universidad Catolica del Ecuador and the Universidad San Francisco de Quito contribute to the development of scientific knowledge in the YNP [17]. Likewise, Populorum Progressio Ecuadorian Fund, together with international organisations such as Wildlife Conservation Society, World Wildlife Fund, Alejandro Labaka Foundation, German Development Bank, include nature conservation in their projects with the aim of promoting the sustainable development of local communities [16]. In addition, there are tri-national projects implemented by the Amazon Conservation Team and the Amazon Conservation Association, which monitor deforestation patterns in the Amazon. Another bi-national project implemented by The Nature Conservancy seeks to reduce deforestation in protected areas and indigenous territories in Ecuador and Colombia (Figure 2). Bibliographic analysis also indicate that local communities are important actors in the conservation of forest ecosystems, as well as being historical peoples [16, 22]. The communities are directly linked to the management of the YNP. Each community has its own development plan that involves aspects such as legal status, land use and coverage, potential threats, control and patrolling, zoning of the territory, and natural resource management programmes, all of which are in accordance with the YNP Management Plan [16]. Finally, there is the presence of oil companies in the buffer zone and a part within the YNP, which are engaged in oil exploitation.

There is also the presence of tourism companies in the buffer zone of the YNP and its surroundings that use the natural resources as tourist attractions.

The focus groups with local *Kichwa* communities revealed that they are facing important difficulties in organising for participating in YNP management plan elaboration. They appreciate that there is some support from the park administration, as well as from other organisations (not always easy to recognise) but, due to insufficient specialised human resources within the communities, they don't feel like having the control over the process. This interest and concern for educating members of their communities was an issue that often arises during the discussions. Also, the language barrier is mentioned when discussing about the relationship between community members and the organisations implementing different projects in the region. Communities are perceiving oil companies and tourism operators as organisations with opposite interests, with the prevalence of oil companies in terms of influencing public bodies decisions. In the context of already known tourism involvement of the *Kichwa* community, their interest and close relationships with tourism operators (at national or local scale) is explainable. However, the focus groups indicate the concern of the communities in the area of vertical integration of their own tourism operations in order to reduce the dependency. They consider that the governmental authorities (including YNP administration) are still not providing enough in terms of tourism promotion.

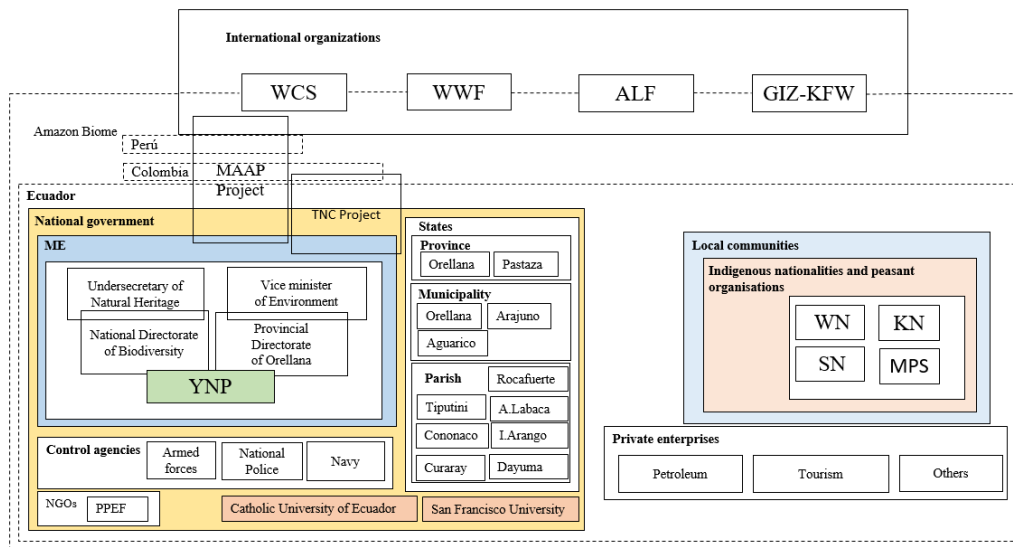


Fig. 2. Diagram of the main stakeholders linked to Yasuni National Park. **ALF** - Alejandro Labaka Foundation; **GIZ** - German Society for International Cooperation (Deutsche Gesellschaft für Internationale Zusammenarbeit); **KFW** - German Development Bank ([Kreditanstalt für Wiederaufbau](#)); **KN** - Kichwa Nationality; **MAAP** - Monitoring of the Andean Amazon Project; **ME** - Ministry of Environment; **MPS** - Mestizos Peasants and Settlers; **PPEF** - Populorum Progressio Ecuadorian Fund; **SN** - Shuar Nationality; **TNC** - The Nature Conservancy; **WCS** - Wildlife Conservation Society; **WN** - Waorani Nationality; **WWF** - World Wildlife Fund; **YNP** - Yasuni National Park

The discussions with the YNP management team confirmed the bibliographic analysis, with particularities in term of their efforts to involve local communities in YNP management decisions. The management team sees itself as the interface between local communities and all other organisations involved in biodiversity conservation, tourism or social projects. They also indicate the *de facto* increasing influence of oil companies on the decisions of public authorities. YNP management team is welcoming the interest of numerous donor organisations in implementing projects related to YNP conservation objectives but complains regarding the

fact that, often, project initiatives are not connected, thus not obtaining otherwise possible synergic effect.

All the above-mentioned stakeholders are related to each other, at different levels and scales (Figure 2). They benefit, directly and indirectly, from the ecosystem services provided by the YNP, and influence the management and social system that constitutes it. In general, international organisations such work for the conservation and protection of natural resources. On the other hand, for the Government of Ecuador, YNP represents a very important source of national income, through oil exploitation, thus making significant efforts for balancing the use of

natural resources. In this general picture, for the local population, YNP it is a source of wood, medicines, food, energy, tourism and agriculture, with evolutions determined by numerous external factors and stakeholders, sometimes difficult to understand, follow and adapt.

4. Conclusions

Due to its global conservative importance, both in terms of biological diversity, natural resources and indigenous communities, YNP management raises challenges that must be addressed through very carefully chosen approaches, adaptive management based on detailed description of socio-ecological systems being a viable option.

Within the frame of a wider consecrated methodology – MARISCO- the results of this study confirm that unsustainable oil exploitation and deforestation for new agricultural land or oil drilling are the main risks not only from the perspective of governmental YNP administration representatives, but also, and this is the most important result of the study, by the local *Kichwa* population. With the exception of *Indillama* community, all members of local *Kichwa* indigenous communities participating in the focus groups consider themselves threaten by the two major above-mentioned risks.

There are numerous entities interested in the natural resources management in YNP, starting with the national and local authorities and ending with local communities and different donor organisations. YNP challenges, in relation with oil drilling and deforestation are under the attention of numerous organisations and there is a clear interest

of numerous entities from the civil society, universities, research centres, etc in finding the best management solutions for the future. Both local community perception analysis and stakeholder mapping resulting from this study will be useful for future description of the SES of YNP.

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