Protected Areas in the 21st Century: Their Value and Benefits for the Global Ecosystem

Mihăiță Cristinel TRIBOI¹

¹ PhD student, Doctoral School of the University of European Studies in Moldova, Chisinau, Republic of Moldova, e-mail prororganizarea@yahoo.com

Abstract: The message of this article is that nothing is certain and, at the same time, we can observe a flow of events from one cause to another that form our interest in protected areas, their use as conservation tools and their threats. If we want conservation methods to be effective and protected areas to be a cornerstone of the strategy, it will continually require both understanding and influencing human values, prioritising and making appropriate decisions about their expansion. It is possible that some trends we know will continue, while other changes in values, economy, politics, demography and climate will shape the future of protected areas. Ignoring the elements of the economy is unlikely to benefit protected areas, so protected areas can be seen as a humanitarian way to economically exploit the environment.

Keywords: *protected areas, ecosystem, right to a healthy environment, socio-ecological cohesion.*

How to cite: Triboi, M.C. (2021). Protected Areas in the 21st Century: Their Value and Benefits for the Global Ecosystem. *Postmodern Openings*, 12(2), 410-432. <https://doi.org/10.18662/po/12.2/315>

1. Introduction

The history of protected areas is closely linked to the history of human civilization. The origins of the creation of protected natural areas are rooted in antiquity. The practice of organizing the first protected areas (for example, the removal of certain natural objects, or the establishment of a special regime for the protection of some territories against traditional nature management) has been going on for several millennia. In India, the first protected areas were created by a special royal decree for the protection of natural resources more than two thousand years ago (Bălteanu, 2006).

The premises for the creation of such spaces, which, with a series of reservations, can be considered the first protected areas, proved to be of two kinds - spiritual and pragmatic (Mallarach, 2008). The spiritual premises are mainly due to the religious beliefs of our ancestors. Various "cult reserves", "sacred orchards" are known since the time of the oldest civilizations in India, Babylon, Ancient Greece. In ancient Greece, a particular concept of a reserved sacred place emerged, and we can trace the influence of that concept to the Western society nowadays. It was the idea of sacrificing a limited space, focusing on a prominent object. At the same time, natural objects, that were distinguished by the specifics of the perception people had regarding them, were chosen: a pit or a group of unusual old trees, a mountain top, a picturesque lake, a cave with a precipice, etc. In such protected sacred places, hunting, fishing, grazing and agriculture were prohibited. "Here, refugees have found shelter, the sick - healing, the thirsty - wisdom" (Wild & McLeod, 2008).

"Protected areas comprise a wide variety of natural and semi-natural environments. Historically, they have taken many forms: from the sacred sites of indigenous communities and hunting reserves" ("Am Introduction", n.d.) in the Middle Ages, to more modern national parks and nature reserves (Brosius, 2004). After the Second World War, the growing appreciation of the intrinsic value of nature grounded the idea that the main role of a protected area was to preserve biological diversity (Barile & Saviano, 2015). "However, since the 1970s, a more blended model has emerged, in which protected areas are viewed as a critical component of a life support system, a repository of biodiversity and, at the same time, a potential source of economic wealth, provided that the wealth is sustainably used. Increasingly, the social and economic value of protected areas receives recognition from society as people become more aware of the ecosystem services that protected areas provide, beyond preserving biodiversity. These services

include clean water, temperature regulation, food provision and aesthetic value” (“An Introduction”, 2020).

The idea of protecting ecosystems against disasters is somehow old. A few of the oldest "protected areas" have been particularly created to protect human communities from extreme climate change and its connected dangers. In Japan, for example, “forest protection was introduced in the 15th and 16th centuries to counter landslides” (Kumazaki, 1991), which led to a series of political decisions that stretch back a long way, “for hundreds of years, so that Japan now has almost 9 million hectares of protected forests designated as buffers against extreme climatic events. In the Middle East, protected areas called hima were established over a thousand years ago to prevent deforestation and erosion by overgrazing” (Bagader, 1997), and traditional "hima" sites are being reshaped into contemporary protected areas. At the tropics, many traditionally administered and community-preserved indigenous areas and sacred natural sites recognize the “value of natural vegetation to protect against floods and landslides caused by extreme weather events” (Borrini-Feyerabend et al., 2013). After downstream flooding in 1998, China decided to stop logging in mountain forests and redesigned these forests as protected areas for the value of their water basin and their biodiversity.

“Protection should also ensure that ecosystem complexity is recovered, especially in the ocean, so that ecosystems are more resilient to climatic shocks. Conservation biology confirms the need to protect large areas and maintain connectivity along altitudinal gradients. Yet, natural ecosystems are becoming increasingly fragmented, and many protected areas have become isolated islands with more intensively used production lands” (Lopoukhine et al., 2012). The protection of plant and animal species, in particular migratory ones, and providing help for them to adapt to climatic changes, will be successful if it will be done primarily if the connectivity between various conserved lands will be maintained irrespective of the regimes of management and administration that will succeed one another.

Therefore, protected areas were established for a multitude of reasons, in wild areas and landscapes with diverse biodiversity and can be met in numerous types of terrestrial and marine habitats. Their denomination is different according to country and their legal regime is a mixture between national law and international regulations. They have been maintained irrespective of political regimes or legal initiatives, therefore integrated landscape management involves all stakeholders, who work together to integrate policies and practices into their various land use objectives, in order to ensure the sustainability of landscapes (Reed, 2008).

Integrated landscape management is an approach designed to address major global issues such as poverty, food security, climate change and biodiversity loss (Cliquet et al., 2009). A coordinated approach is needed to address all these issues, as they are interconnected, and to benefit from the heterogeneity of the elements that make up these landscapes (Curran, 2014).

The integration of protected areas involves a two-tier process: 1. maintaining the ecological integrity of the landscape by connecting protected areas that are part of a wider grid of protected and managed land (including aquatic and terrestrial ecosystems), for the purpose of continuing environmentally friendly processes, functions and services; 2. incorporating the design and management of protected areas into a wider grid of state and interstate (regional) land use plans and natural resources laws and policies. This leads to a multitude of ecological and socio-economic benefits. Integration can take place at different levels, such as the national level, when it involves the integration of the whole network into national policies, or the regional level, when it involves the integration of a part of the network in the territory of a natural region or province.

The integration of protected areas and conservation areas, with the participation of stakeholders and rights holders at every step of the management cycle, provides the opportunity to commit to playing an active role in the conservation of a region (EC, 2000). The conceptual framing of Darrell Addison Posey's "cultural and spiritual" values (1999) became very important for the later evolution of the international natural heritage conservation organizations, such as UNESCO (1974) and IUCN (Lausche & Burhenne, 2009). IUCN is the greater and the dominant biodiversity conservation organization worldwide, being formed of over 14.000 governmental and non-governmental organizations; about 16.000 scientists and experts participate voluntarily, organized under the patronage of six commissions.

Expert assessment, on a scientific basis, has gradually developed and given rise to the assessment made by the traditional keepers of the natural, religious, cultural and spiritual values of the natural heritage, such as indigenous peoples, spiritual leaders (of religious communities, such as Mount Athos, etc.) and local communities (Mitchell, 2013). Thus, protected areas experienced a transition from tangential to intangible heritage, including religious and spiritual values. Step by step, conservation organizations became aware of the imperative to raise awareness and the support of the community for the conservation of the natural heritage in collaboration with religious organizations. This achievement has attracted

scrutiny regarding the contributions made to conservation activities by other religions and religiously oriented organizations, that have specific worldviews in the application of biocultural initiatives (Verschuuren et al., 2010).

However, the legal approach to protected areas is essential, with a decisive connotation in establishing their legal and functional framework. “This results in an increased recognition of cultural and spiritual values and the inclusion of traditional law and cultural practices in the conservation of the natural heritage, such as indigenous areas and territories (ICCA) and sacred natural sites (SNS), together with their custodial communities” (Mallarach, 2012). The International Union for Conservation of Nature (IUCN) regularly “adopts resolutions and recommendations that are known to have global influence, setting the global conservation agenda. They support the development of international and national environmental legislation, identify emerging conservation issues and promote specific actions on ecosystems, protected areas and species” (International Union for Conservation of Nature, 2012).

Each nation developed its own approach to protected areas and, initially, there were no common standards or even a common terminology regarding their legal framework. The prime endeavor to clarify the terminology on protected areas was made in 1933, at the “International Conference for the Protection of Fauna and Flora in London” (Convention Relating to the Preservation of Fauna and Flora in Their Natural State, 1933). In that particular occasion, four categories of protected areas: the national park, the natural reserve, the fauna and flora reservation and the natural reservation where hunting is banned. The appearance of a global conservation movement after World War II motivated the emergence of a worldwide structure for protected areas. The “IUCN Commission on Protected Areas” - now WCPA - has prepared a “World List of National Parks and Reservations”, the first version of which is known as the “UN List of Protected Areas” (Deguignet et al., 2014).

Protected area management regimes vary widely. “Some protected areas ban activities such as hunting or extraction of natural resources, while for others, human activities are part of their identity and even necessary for maintaining and restoring of target species and habitats. Participation and involvement of people is a key factor for the establishment and management of protected areas” (“An Introduction, n.d.). This change in the perception of what a protected area is also involved the shift from the design of protected area as an isolated space to their recognition as part of an ecological network. Protected area networks allow for a more effective and

harmonized management of the shared natural heritage. The concept of promoting international cooperation for the conservation and wise use of the natural heritage has also gained appreciation since 1970s” (“An Introduction”, n.d.), giving rise to the creation of the typology of international protected areas and networks of protected areas.

“The World Conservation Union (IUCN)” plays a global leading role in defining different types of protected areas and influencing the way protected area systems are developed and managed. IUCN presented a “new paradigm” of protected areas, which became the main focus of the “2003 World Parks Congress”. The paradigm focuses on the benefits of alleviating poverty, re-training professionals in protected areas and focusing on the interaction between people and nature for the local population (Locke & Dearden, 2010).

The establishment of the world's first protected area (PA), Yellowstone, in 1872, was the reaction of the Western culture to the indignant processes that led to the continuous and unrestrained degradation of biodiversity and ecosystem services (Pretty, 2011; Reed, 2008). Although Yellowstone was the first, many more protected areas followed, their numbers growing exponentially worldwide. According to Chape et al. (2008), “in 2005, a total of 144,296 protected areas were reached, covering an area of 19,381,000 km², or 12.9% of the earth's surface”. This is certainly an universal accomplishment, but the creation of PAs without real legal coverage cannot ensure the perpetuation of biodiversity.

When many parks were created, sometimes important factors were left out and not considered, like the political, cultural or social problems that the creation of those parks could have stemmed. Natural resources became unavailable for the native communities, even if they were essential for their way of life, as the restraints on exploring such resources were thought in absolute terms, and that started a migratory movement away from those sites, with no adequate compensation for the indigenous population. The negative impact on local communities and their negative reactions became, though, unavoidable, as their traditional way of life was profoundly disrupted. This approach has led to hostile attitudes towards habitat conservation strategies (Barnosky et al., 2012), jeopardizing protection policies because of the conflicts that arose between protected park managers and local communities, minimizing the efficacy of PA biodiversity conservation.

Some authors state that “when local communities are excluded from PA management and their needs and aspirations are ignored, it becomes extremely difficult to implement conservation policies” (Mwongela, 2010).

There is evidence to suggest that local communities to and will probably be more compliant to engage in long-term conservation strategies when their knowledge and opinions are incorporated into PA decision-making processes (Cook et al., 2013). On the other hand, other authors have suggested that strict enforcement of the law is the cornerstone for the success of conservation in a PA (Balmford, 2002). Therefore, despite the extensive knowledge about PA management, there is no agreement on how with the acceptance of PA policies might be obtained in the best way possible by collaboration with local communities.

2. The interaction between economic actors, the state and the civil society regarding protected areas

Protected areas (PAs) continue to be a primary response of human societies to the loss of biodiversity around the world (Jenkins & Joppa, 2009). Indeed, with the growth of human population, the extension of the urban territory and forest exploitation, the creation of PAs has become a critical issue worldwide (Ghimire et al., 1997), especially in relation to their role in the local development of rural or urban areas. Different models of PA coexist in terms of roles and relationships between the institutions and the stakeholders involved in their designation and governance, and how biodiversity conservation strategies are adapted to local social and environmental contexts (Hockings et al., 2006).

However, a common theme is the issue of the social legitimacy of PAs; if the management of a protected area is not considered legitimate, it can be perceived by communities as an usurpation of local rights (Foucault, 2004). Because the establishment of protected areas has a particular impact on people, a socio-ecological approach to protected areas is needed. Indeed, the PAs in which people live have become increasingly numerous, and a PA is often a particular type of socio-ecological system (Cumming, 2015).

Competition for control and access to land is growing worldwide, creating numerous conflicts and raising new questions about the relationship between humans and nature (Lockwood et al., 2012). Social representation, value systems and social innovation play a key role in conserving biodiversity. In this context, adaptive management has become an important tool, that provides links between conservation science and conservation practice (Margoluis & Salafsky, 1998). Ecosystem-based management is an experiment of continuous adaptive management (Grumbine, 1997) that connects private and public landowners, business corporations and conservation organizations with scientists, in order to plan and act on a larger scale in the benefit of protected areas.

Relationships between social and ecological systems have become a central issue in biodiversity conservation and sustainability sciences (Ostrom, 2005). The EM and ES frameworks have several characteristics and principles, including the recognition of objectives that should be implemented within the society, like the objective of decentralized management, taking into account the extended impact of environmental actions, understanding the socio-political-economic contexts that reduce market distortions, the need for action at different spatial and temporal scales, acceptance of change and uncertainty, long-term management for future generations, and the critical importance of involving all relevant stakeholders (Szaro et al., 1998).

Ethically relevant qualities, such as awareness, sensitivity to others and ethical care practices for both the people and the habitat are at the heart of ES. ES exploration can lead to acceptance and solidarity through cultural diversity beyond the borders of PAs (Rössler, 2005). The implementation of biodiversity conservation and integrated development projects takes place in the context of a triple uncertainty involving scientifically measurable ecological evidence, social dynamics and representations, values and normative uncertainty. Based on monitoring and experiments, the natural sciences help clarify the first class of uncertainty, improve our understanding of the functioning of SES, and implement adaptive management (Barnaud et al., 2011).

Social and political sciences identify and map social structures and representations, but also power relations and institutional arrangements (Reed, 2008). All this knowledge can be useful for the implementation of adapted co-management (Foley et al., 2005) within local communities, but to deal with norms and values requires environmental policies and ethics, and an approach that integrates the dynamics of the relations between people in the community that is involved in this processes, together with the dynamics of knowledge and values and the dynamics of SES.

The use of computer simulators, multi-agent models and role-plays helps to stimulate collective learning about SES by creating, modifying and observing a model and its simulations (Bousquet & Le Page, 2004). Finally, despite a costly process, the participatory modeling approach improves the decision-making process, both in its technical (informational, action) and sociological dimensions (cooperation and the actor's place in the decision-making process), and encourages constant feedback between improved knowledge and decision-making (Grimm & Railsback, 2005; Grumbine, 1997).

The privatization of conservation activities comes in different types. The span of activities is diverse, from contracts with the private sector to the provision of specific services, such as food and accommodation, to public-private partnerships for park management, or the full administration and operation of private property. Numerous benefits can be brought by the private sector to the administration and management of protected areas. "Businesses and NGOs can provide financial and technical resources that would not otherwise be available for conservation. This is especially important in developing countries, where authorities are often underfunded" (Kramer et al., n.d.). Concession agreements and associated user fees are also elements that can ensure the self-sustainability of protected areas from a financial point of view .

"Another advantage is that the private sector can be more successful than the public sector in providing the marketing and operational expertise needed to compete in the tourism industry. Although these approaches have advantages in theory, it is important to consider the conditions" (Kramer et al., n.d.) for an improved conservation of the protected areas and the actual results. One must pay attention to the trend in economy when speaking about the development of protected areas. Decades of contradictions were brought on by this issue, because the need to keep the natural heritage intact sometimes comes into conflict with large economic interests.

There are different interpretations of what causes the destruction of biodiversity and how the existing economic systems can influence these causes. As some scholars pointed out, what is important to emphasize is the dominant role of macroeconomics when the future and growth of national economies come into question. Growth-oriented and production-based tools, that guide macroeconomic policy, can distort the image of vulnerability that protected areas have. The damage to these environmental policy instruments can indeed lead to a tendency to facilitate the growth of extractive industries to the detriment of terrestrial landscapes, seascapes and healthy ecosystems.

Although the size of protected areas may increase, it will not be a surprise that, in case the current processes grow even more, the efficiency of protected areas will continue to decline. The appropriate response to the issue of macroeconomic plans that eliminate the conservation, sustainability and effective planning of the landscape / seascape is a problem subjected to many disputes. One of the reactions was to focus on how the environment, ecosystems and nature should be "valued".

Nature poses a series of valuables that are taken into consideration by the stakeholders involved in the decision process at the economic level.

These valuables can be considered by reference to their worth and effects in time; and “may involve measuring the value of an ecosystem service, such as the availability of drinking water and its replacement value, if it is damaged or polluted; or the way alternative industrial and energy pathways could generate new forms of wealth that are not so destructive to the natural environment - for example, the use of solar energy” (Worboys et al., 2015). Critics of the "valuation" approach point out that the application of a value only encourages the private sector to accelerate the extraction of the product (i.e. to change its status to a commodity that can be valued in a material form, even if its original natural state does not necessarily have a capital value) or may lead to its privatization. In care of privatization, this can lead to an accelerated degradation of the nature, which in turn will have a strong negative impact on the already growing poverty and vulnerability. Finally, it causes some landowners to increase their income to the detriment of those who do not own heritage valuable land (protected areas), but generally those who do not own land become poorer and poorer and, in turn, have to transform even more resources into money in order to overcome their poverty, while at the same time the amount of resources decreases, creating a spiral of ecological disaster. The impact of protected areas on local society and the economy is widely recognized, but still growing in the 21st century. Compensation for impoverishment caused by protected areas requires the knowledge of local contexts. The assessment of the multiple benefits of conservation will be incomplete without a good understanding of the costs involved and the losses that the local population will sustain.

3. The role and importance of protected areas: socio-ecological cohesion

The pragmatic premises have been known since ancient times and are no less widespread. As a result, other types of PAs have been created - for the protection and reproduction of animals used in hunting sports. Similar protected areas are known among African tribes, American Indians, Australian Aborigines. Initially, such protected areas were created mainly among those nationalities whose lifestyle was associated with hunting. Later, they began to be created for the hunting purposes for noblemen. In Europe, the practice of organizing hunting grounds for the wealthy began about a thousand years ago. These were strictly protected hunting grounds in Medieval England and France, and only rulers and great feudal lords could hunt.

The elements of the environmental regime were established not only for the animals bred for hunting purposes, but also for plant resources.

However, the first truly scientific approaches to the organization of protected areas dates back to the 19th century because of two main reasons. One of them was associated with the worsening of environmental problems due to the industrial revolution, the decrease of forested areas and the increase of agricultural land, together with and the extinction of several species of animals and plants.

The second reason is associated with the development of scientific thinking in the mid-nineteenth century. One of the ways to solve the ecological problems was to create protected areas. In Western Europe, in the early nineteenth century, natural monuments appeared, consisting of interesting geological formations and sections of virgin forest were taken under protection. In the USA, national parks began to be organized in 1872, and in Russia in the 90s of the 19th century, when the first reservation was established. During the same period, the main conceptual approaches for the creation of protected areas, existing to this day, were outlined. In the last 50 years, the total spread of protected areas in the world has increased from an area about the size of Great Britain to a size that exceeds the area of the entire African continent. In terms of areal, protected areas are now ranked third in the world, after forest landscapes and pastures, surpassing even agricultural land.

Recently, most protected areas have functioned like "islands in an ocean": isolated sections of the earth's surface, created mainly for nature conservation and / or limited tourism. Subsequently, the concept of "green networks" became dominant, aiming to create PA systems that are functionally and territorially interconnected. According to modern approaches, along with the conservation of biological diversity and the landscape, priority tasks include the need for active cooperation with local people living in or near protected areas, the analysis of economic and social benefits of protected areas, the management of the flow of visitors to protected areas, etc.

The management of interactions between human activities and environmental issues, such as biodiversity conservation, takes place in institutions set up at different levels of government. However, social issues, such as the willingness of stakeholders to share responsibility for biodiversity conservation and choice of management activities, or the growing awareness of biophysical interdependencies and physical reconnection with nature (i.e. experiencing nature directly) may be better ways to address the issue. To illustrate the various social dimensions of SE, we identify eight types of socio-ecological interdependencies that can be adapted to the context of

biodiversity conservation. This schematic typology is based on three key principles.

First and foremost, a PA can be an incentive for a community (a sense of property or belonging), that causes an interested party or a social group to use the land and its natural resources wisely and in a manner that supports people's belief that they share certain values and goals. The second is the voluntary obligation (interest) of a stakeholder or a social group to adopt a system for using the land and its natural resource according to a strategy that supports people's belief that some are better equipped than others to achieve these goals. Third, we enumerate the obligation (laws and social rules) to use the land and its natural resources in a sustainable way and to support others to achieve harmony with nature.

Socio-ecological cohesion can be based on the idea that human societies are part of a living community and share a common identity and self-awareness (i.e. a deep solidarity). Solidarity can also be based on responsibility towards others (i.e. radical solidarity) or on complementary interests in wealth production or self-protection (i.e. self-interested or calculated solidarity).

These principles of solidarity, based on wise, strategic and sustainable actions, are essential elements in the functioning of SES at both an individual and a community level. Implementing an ES-based conservation policy requires the involvement of local actors. In practice, this involves the establishment of an efficient management of common goods and, therefore, in terms of conservation, of a respectful use of the ecosystem and limiting the negative impact of exploitation. Hence, territorial interdependence (TI) provides coherence to socio-political interdependencies and leverage for public policies that promote sustainable and inclusive territorial development.

As a result, local stakeholders often end up in heated conflicts with environmentalists and conservation scientists who want to help them (Alphandery & Fortier, 2011). We must take into account that nature conservation is still the main objective of protected areas. The conservation of biodiversity - of species, of the diversity of habitats and ecosystems - underlies the function of the ecosystem and has many practical and utilitarian benefits. However, research in several databases “provides strong evidence that protected areas are one of the most effective tools for slowing down biodiversity loss, and many species continue to survive only because of the protection provided to them within national parks, nature reservations and other protected areas” (Stolton et al., 2015).

When speaking about the way to turn ecosystem services into benefits that can be measured both economically and socially at a community level, three aspects must be taken into account: 1) quantifying and evaluating (often qualitatively) the value of different benefits; 2) the understanding of other benefits, including forgotten benefits of preserving the ecosystem; and 3) understanding who receives these benefits. Usually, economic benefits are quantified by using specific techniques, but there are also other ways to summarize the information about these aspects. One such way is the analysis of the context in which benefits that are contradictory might appear (the so-called trade-offs) - for example, if it is decided to turn a forest into a protected area in order to avoid ecological water problems in the area, the population will have no shortage of water, but at the same time the local economy will suffer because the wood will not be sold for profit and the deforested land will not be used in agriculture.

One of the persistent challenges in providing services for the ecosystem is that many services that are maintained through sustainable management or ecosystem protection are diffuse in nature, offering many people a small number of benefits that are difficult to measure (because the profit is not discussed in terms of money or property rights), while an excessive exploitation will bring large gains to one or more people with many benefits (for example, with clear property rights). So, the owner who cuts a forest in a pool of water has the immediate advantage of monetary gain in exchange for the wood they sell, while the population living in the downstream city is affected by the growing lack of quality of water and loses financially because of the purification costs of water, or faces the risk of epidemics. The net values of the river basin is much higher for the entire population in that region than the value of the wood obtained by fewer members of society, but the rights of the owner who has clear property rights over the wood are much clearer, than those of the inhabitants of downstream cities, who do not have clear property rights over the water or the clean products that the forest provides.

Attitudes will be different according to who has to benefit, people who suffer from the establishment of a protected area (economically, culturally or by displacement to a different area) are prone to be resentful, while those who will have the long term benefits (that a clean environment brings) are prone to be supportive. Those who oppose the establishment of a PA can be convinced to support the initiative if their economical and living conditions are solved. One way is to award them a share in the profits resulting from the creation of the PA. At the same time, the interests of all

the stakeholders must be balanced, in order to avoid opposition. This is the big challenge for the managers of protected areas.

“Although most of these benefits can come from any natural ecosystem, protected areas often have the advantage that they are already established as beneficial, successful and cost-effective tools for sustainable ecosystem management, they benefit from laws and policies, management and governance institutions, knowledge, staff and management capacity. Thus, they often maintain a wider range of ecosystem services than other areas and also come with much more associated security than irregular and unregulated areas, which are more open to degradation and rapid change” (Stolton et al., 2015). However, protected areas are not the only way to preserve ecosystems: there are other ways to organize land and water, which can be well managed under the control of communities, governments and companies, and which can perform functions that are similar to protected areas.

The requirement that protected areas provide an equitable environment for all stakeholders is enshrined in international agreements. Equity has a special meaning when speaking of PAs, because the benefits of establishing such areas are enjoyable by people worldwide, while the negative costs affect only locals. Therefore, there are three sides to equity when speaking of PAs: 1. the equitable distribution of benefits and costs; 2. ensuring the participation of all stakeholders in the decision-making process; 3. Respecting opposing views, customs and beliefs.

The “Convention on Biological Diversity” has been preoccupied with defining equity in the context of PAs, which is seen as follows: “Protected areas should also be established and managed in close collaboration with and through fair processes that recognize and respect the rights of local communities and indigenous peoples as vulnerable populations. These communities should be fully committed to the governance and management of protected areas according to their rights, knowledge, capabilities and institutions, should equitably share in the benefits resulting from protected areas and should not incur unfair costs” (Klein et al., 2015).

Protected areas can complement other responses adapted to ecological needs, “by maintaining ecosystem integrity, buffering the local climate and reducing the risk and impact of extreme weather events, such as storms, droughts and rising sea levels. Such ecosystem-based approaches can complement or even replace more expensive infrastructure investments to protect human settlements” (Quintero, 2007). Therefore, protected areas contribute to ensuring food and water security in a changing world.

Many “protected areas act as natural reservoirs for agriculturally important biodiversity, including pollinators and pest control. Protected areas in dry areas include sites of origin for important food crops such as barley, sorghum and other cereals” (Lopoukhine et al., 2012). Elsewhere, dry land protected areas contribute to the introduction of more sustainable land management practices, that reduce land degradation and protect some of the largest wildlife habitats on Earth.

Protected areas maintain the integrity of the ecosystem, buffer the local climate and reduce the risks and impacts of storms, droughts and rising sea levels - all of which are expected to be more severe and frequent due to climate change (Stolton et al. , 2003). “The multiple roles of protected areas will become more valuable as these climatic events become more severe, helping to reduce the impact of natural hazards and disasters and buffer vulnerable communities against floods and tidal events, landslides and storms” (Lopoukhine et al., 2012).

Protected areas can help reduce the risk of ecological disaster in three ways: 1. “maintaining predominantly natural ecosystems that buffer against sudden natural hazards, such as tidal waves” (Lopoukhine et al., 2012), flash floods (wetlands, floodplains) and landslides (forests and other native vegetation); 2. the maintenance of “traditional crops and cultural ecosystems that can help communities cope with extreme weather events and natural disasters, such as agroforestry systems” (Lopoukhine et al., 2012), the cultivation of drought-resistant crop varieties; 3. there is now a growing body of evidence on the economic benefits of maintaining natural ecosystems. Wetlands are some of the most endangered ecosystems on Earth and are generally underrepresented in national protected area networks, yet they provide many vital functions of the ecosystem. “Montane wetlands, rivers and freshwater lakes serve as vital areas and important sources of water for irrigation, domestic and industrial use” (Lopoukhine et al., 2012). Wetlands can also act as filters, removing pollutants and improving water quality. The critical role of protected areas in reducing vulnerability and contributing to disaster mitigation is already well documented. “What is now needed is greater awareness and appreciation of the many benefits of protected areas and appropriate measures to include ecosystem-based solutions in policies and practices. It will also require innovative funding mechanisms and institutional arrangements to promote more sustainable management of green land and infrastructure as part of national and local strategies, to ensure the safety of citizens against disasters. Such developments can also meet the needs of recovery” (Lopoukhine et al., 2012) and long-term living by providing emergency food and medicinal

herbs. Improved protection of natural habitats, in particular through the establishment of protected areas, can provide a third cost-effective pillar for disaster strategies, that also includes better early warning and planning systems, as well as sustainable infrastructure.

Direct “comparisons between the costs of investing in infrastructure and maintaining natural habitats as protected areas are rare, but some countries are already committed to investing” (Lopoukhine et al., 2012) in protecting or restoring habitats as part of disaster risk reduction strategies. In Argentina and Ecuador, for example, World Bank loan-financed flood control projects use natural wetland storage properties, integrating them into “flood life” strategies that incorporate forest-protected areas and river corridors.

Investments “in protected areas worldwide (from both national and international funds) are difficult to calculate, but have been estimated at \$ 6 billion annually with \$ 750 million spent each year in tropical countries” (Balmford & Whitten, 2003). This means “an average of \$ 453 per km² globally, although only \$ 93 per km² is spent in tropical countries. Establishing and managing a global network of protected areas would cost about \$ 23 billion per year, more than four times than what is currently spent, but middle-income countries would require less than a tenth of that amount” (Butchart et al., 2012).

Initiatives such as the “Study of Ecosystem Economics and Biodiversity (SEEB)” have given “new impetus to the potential of payments for ecosystem services (PES), especially for water and carbon. Some government agencies and private sector companies already recognize the key role of protected areas in maintaining water supply and other services” (Lopoukhine et al., 2012). We still, however, raise questions related to governance; whether funds can be allocated for the management of existing protected areas and how to reconcile REDD implementation plans with existing plans and concessions already granted. Ensuring a fair distribution of carbon revenues to communities affected by improved forest protection can prove to be a key challenge in REDD implementation.

Protected areas (PAs) are considered the cornerstone of biodiversity conservation. In recognition of their role in protecting species and ecosystems, Objective 11 provided by the Aichi Convention on Biological Diversity (CBD) (UN, 2011) requires countries to set aside land for conservation, in order to protect 17% of the land and 10% of the marine surface by 2020. Tracewski et al. (2016) made a similar analysis and also gave full protection to the “Alliance for Zero Extinction Sites and Important Bird and Biodiversity Areas”, which they assumed to be the equivalent of “areas

of particular importance for biodiversity” mentioned in Objective 11 of the Aichi Convention (UN, n.d.). Butchart et al. (2012) used the density of the human population as a surrogate for costs.

Montesino Pouzols et al. (2014) also accounted for future habitat loss by comparing existing priorities to environmental interests, and thus updated the evolution that the benefit argument is expected to have based on the anticipated change in land use in these areas by 2040. This starts from the assumption that PAs cannot cause habitat loss and will be considered residual land for future agricultural expansion. Under these conditions, the overall protection target should be increased from 17% to 21% in order to achieve the level of protection required in current land use, due to the low contribution to these percentages of areas subjected to habitat transformation and the loss of effective conservation opportunities.

The need to recover a vision over systems from an economic, social and environmental perspective was highlighted in the effort to achieve sustainability (Scalia et al., 2018). “A systems perspective supports an unified view of the effects that action in each of the three spheres of sustainability (social, economic and environmental) will have, as represented in the well-known Triple Bottom Line framework” (“Training On”, 2014). A key challenge in the governance approach to sustainability is to align the different objectives that arise from the different perspectives involved in development issues.

4. Conclusions

Following the analysis of the literature on protected areas, we can see a pattern of change in the scales of conservation and responsibility for landscape and ecosystem conservation in recent centuries and decades (IPPC, 2014, p. 151). If we consider that ecosystems operate at different scales, it is significant that ecosystem conservation and governance must be ideally aligned to create synergies and positive cohesion between protected areas, networks of protected areas and the socio-economic activity of people. The rights, the duties of governing the ecosystem must be well respected, and the different scales should not be approached chaotically, but in a manner that insures the respect for the principles of sustainable development in protected areas.

The studies analyzed in this article have been useful in identifying the most effective networks of sites oriented to the protection of under-protected species and ecosystems. As Visconti et al. (2015) say, “however, none of these studies estimated or sought to maximize the impact of these PAs in reducing biodiversity loss, i.e. they did not investigate how the

proposed PAs would reduce habitat loss in a future anthropogenic threat scenarios. Therefore, there is no evidence that the proposed expansion plans for PAs would improve the prognosis for these species”, despite the fact that this is the ultimate goal of Objective 12 of the Aichi Convention, which commits countries to ensure that “by 2020, the conservation status of known endangered species will be improved and sustained”. In addition, none of these studies attempted to estimate potential conflicts between the reservation of land for conservation and alternative human uses, such as agriculture or agrarian forestry.

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