The complexity of conservation - addressing biodiversity loss in Madagascar

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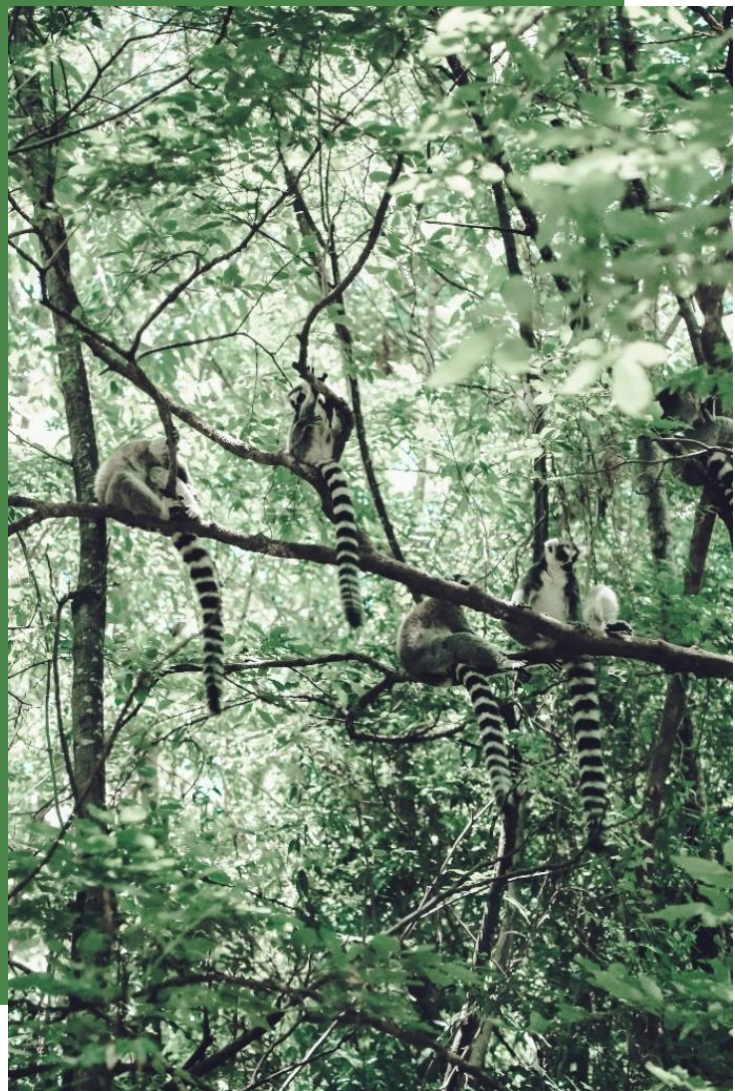**Division of Global Sustainable Development**
2021

Figure 1: Lemurs in Madagascar

Executive Summary

Biosphere integrity, though it can seem like it based on the approach media sources and those trying to reduce the importance of the issue, is not merely about the extinction of species. Its degradation is a complex threat, capable of disrupting the entire operation of ecosystems and having a fatal effect on humans, who rely on said systems to sustain them. Biodiversity loss is still in the process of being accurately quantified, and it is also increasingly obvious that most conservation efforts employed today are not going to be sufficient in the long run. Wildlife conservation in various places has varying success depending on its regard for local and global factors. Perhaps nowhere is this more apparent than in Madagascar, a biodiversity hotspot where the exploitation of nature needs to be stopped, but without the endangerment of local communities who rely on that very environment. The implementation of protected areas is a promising start; however, many conservational measures cannot fulfil their potential or even backfire because they disturb the flow of provisional ecosystem services. After reviewing the main issues with current governance concerning biodiversity conservation in Madagascar, a restructuring of those is proposed. In the policy recommendations, the emphasis is on committing locals to environmental protection by using their knowledge and providing them incentives via economic involvement, for example through employment opportunities in the fields of ecotourism and infrastructure development. Attention is called to the delicate balance of bottom-up programmes and centralization, as devising a comprehensive international conservation scheme requires linking local and global scales.

Foundational Science: Discussion & Analysis

The components of biodiversity loss can be understood in several ways and the most fitting approach is still under research. This being said, Steffen et al. in their 2016 update on the planetary boundaries framework (Rockström et al., 2009) addressed the existence of genetic and functional biodiversity, which are distinguishable, but nevertheless equally essential components of the boundary. Genetic diversity refers to the richness of genetic material available in the biosphere. High numbers of gene variation are an essential contributor to the successful evolution of a species, consequently, if this decreases significantly, so do the chances of adaptation and survival (Meuwissen, Sonesson, Gebregiwergis and Woolliams, 2020). Functional diversity on the other hand concerns the functional traits organisms possess, a disturbance of this leads to changes in how the ecosystem operates - nutrients, stability of species interactions etc. (Hillebrand and Matthiessen, 2009). Both are needed to be observed if humanity is to understand the mechanisms of biodiversity loss and the chances to hold it back. As human-induced biodiversity loss has taken on such a scale

that many are convinced that the sixth mass extinction is underway (Kolbert, 2014), it is crucial to concentrate on policies that help conserve biodiversity, as well as deal with its relevance to economic and societal structures.

In Madagascar, due to being an isolated island, an unique ecosystem formed with exceptionally high levels of biodiversity and about 80% of its species being endemic - meaning that they are not to be found anywhere else (Gardner et al., 2018). It has been classified as a biodiversity hotspot, which definition also includes the fact that the island has lost more than 70% of its primary native vegetation, happening mainly through organized deforestation (Ganzhorn et al., 2001). The environmental problems brought forth by these land cover changes (Brinkmann et al., 2014) affect plants, animals and humans alike. Allnutt et al. (2008) showed that just between 1950 and 2000, 9.1% of the total biodiversity was lost due to deforestation. Madagascar is regarded as one of the poorest countries on Earth, has recently experienced political turbulence and many of its inhabitants rely on the degrading ecosystem to make their living (Scales, 2014). Several species, for instance the lemur (Borgerson et al., 2016) are partly endangered because they are hunted out of need by locals who each year have it harder while trying to sustain themselves in the midst of depleting resources and the strict regulations imposed to deal with those.

Madagascar has become a poster example of the issue from the 1970's onward (Scales, 2014), as a result of increasing recognition that a high percentage of the island's species are threatened by extinction. Thus, in the past decades considerable efforts were made to protect the integrity of the ecosystem, save species and their habitats, and call attention to the dangers of biodiversity loss. The country has received international help - as well as pressure - in setting up protected areas (PAs) (Gardner et al., 2018), but the system in its current realisation cannot cater to the effort that should be made to deal with the threat. Furthermore, the difficulty of regulating deforestation because of plantations and logging is a concerning problem regarding economic policies and international trade, showing the connections of several global challenges.

Assessment of Existing Governance

Currently, genetic and functional biodiversity loss are quantified as Steffen et al. (2016) suggested: extinctions per million species-years (E/MSY) and the Biodiversity Intactness Index (BII) respectively. However, the authors claim that these are not completely sufficient to help describe all aspects of biosphere integrity and are to be improved. In fact, to accurately address ecosystem degradation, governance needs to consider socio political and economic factors as much as scientific measurements, the reasons for which come to light while examining Madagascar's current environmental protection measures (Rakotomanana, Jenkins and Ratsimbazafy, 2013).

The PA system implemented in Madagascar consists of 144 parks (shown in Figure 2), the majority of which are managed by Madagascar National Parks Organization and NGOs, not the government (Razafison and Vyawahare, 2020). These areas promote ecological conservation through restricting laws on the use of natural resources, as well as through attracting substantial tourism to certain national parks, for example to Andasibe–Mantadia in eastern Madagascar (Newsome and Hassell, 2014). These are a number of promising solutions in terms of wildlife protection and overall, they have the capacity to greatly help the island's biodiversity. This being said, the system struggles with financial sustainability; and
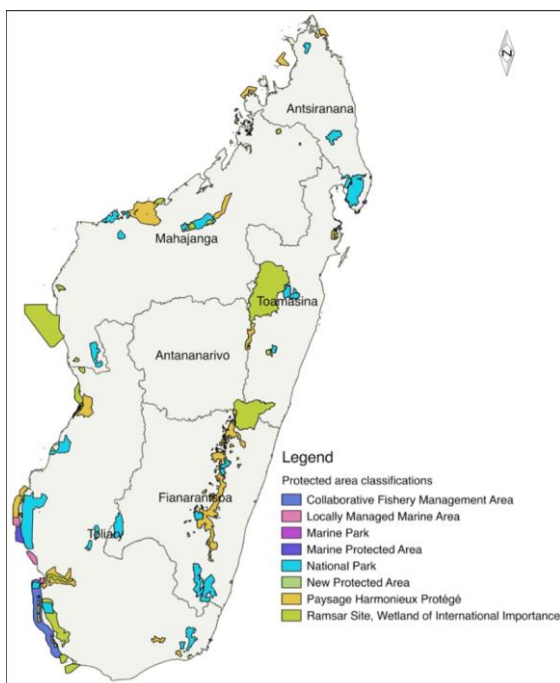

Figure 2: Protected Areas of Madagascar as of 2018 (Williams and Pilcher, 2018)

the transformation and security of local livelihoods (Rakotomanana, Jenkins and Ratsimbazafy, 2013). Deforestation has also persisted despite the efforts, and the environmental minister of the country recently called the whole system a 'failure' (Razafison and Vyawahare, 2020), saying that it does not have the capacity to help those living in poverty, consequently it cannot successfully promote the importance of conservation.

One of the reasons current conservation efforts cannot be described as completely successful is that the schemes put in place interfere with the Malagasi people's connection to their environment. Table 1 shows how a big proportion of locals rely on ecosystem services in their everyday lives. These provisions range from wood used in numerous ways to wild foods and natural medicine, and access to many of these is restricted by protective rules, causing communities to struggle (Kari and Korhonen-Kurki, 2013).

Such contradictions have been recognised worldwide and they led to the proposal of 'Payments for Environmental Services'. According to Wunder, PES 'can be defined as voluntary transactions between service users and service providers that are conditional on agreed rules of natural resource management for generating offsite services.' (Wunder, 2015:8) In practicality, this means the payment of groups or individuals in exchange for them to modify their practices concerning their environment and actively try to conserve the ecosystem. However, PES schemes are viewed by many as paradoxical and yielding

Provisioning ecosystem service	Examples	Access	Demand[a]	Change in demand[b]	Stock[c]	Change in stock[b]
Timber and wood products	Construction of houses, fences, dams, animal enclosures, utensils	Tightly restricted	High	↗	– Community forest	→/↗/↘
					– Eucalyptus and other plantations	→/↘
Arts and crafts materials	Mats, baskets	Tightly restricted	High	↘	– Cultivated	↗
					– Wild	↘
Fuelwood	Firewood, charcoal for energy production	Controlled – Firewood: only deadwood – Charcoal: only planted trees	High	↗	– Community forest	→
					– Secondary forest, *kapoka*	↘
					– Plantations	↗/↘
Natural medicines	Treatment of illnesses	Generally available outside the park	Moderate	↘	– Community forest – Secondary forest	–
Food: Wild foods	Wild plants, wild animals	Restricted, partly forbidden	Low/moderate	↘	– Village	↘
					– Secondary forest	↘
					– Park forest	↗
Food: Crops	Cultivated crops (cassava, beans, etc.)	Land and practices tightly restricted	High	↗	– Fields in and outside forests	↘
Other plant materials	Flowers, flower pots, compost material	Partly restricted	Low	↘	– Secondary forest	–
				↗ (compost)		
Water	Rice cultivation, other planting and agricultural uses, drinking	Free access	High	→	– Whole forest area	↗

Table 1: Access restriction on ecosystem services in the forests of Madagascar (Kari and Korhonen-Kurki, 2013).

mixed results. In Madagascar, a number of management transfer contracts were implemented under the 1996 GELOSE law (Pollini and Lassoie, 2011), which allows local communities use of the state-owned land according to their needs and provides a 'mediator' for the purpose of facilitating communication about environmental protection. However, based on a study carried out by Brimont and Karsenty (2015) in the CAZ forest area in eastern Madagascar, the employed system of PES and protected areas devoid locals from their property rights and do not create sustainable economic alternatives to the unsustainable practices that are being banned.

To decrease the harm done by industrial processes the concept of biodiversity offsets (BOs) was also employed in Madagascar. Two of the most significant mining companies performing activities on the island were inspected about their strategy to balance between the negative and positive impact of their activities. QMM/Rio Tinto and Ambatovy together create a significant proportion of the economically weak country's fiscal revenue, thus, it is exceptionally important to create a framework within which they can operate while minimizing the harm they cause. The companies have invested in conservation practices and partnered with organizations to develop an offset methodology (Bidaud, Hrabanski and Meral, 2015). Research results conclude that 'in BO projects, the same company is implicated in both the degradation and the conservation. This apparent paradox is not well understood by local actors who are skeptical regarding forest conservation by mining companies.' (Bidaud, Hrabanski and Meral, 2015:7) Besides this apparent contradiction, the difficulty of offset schemes lies in international coordination

and the need for scientific prediction models concerning ecological degradation, which is a problematic genre due to the quantifying of biodiversity loss being a contested process and the nonlinear nature of its change (Mace et al., 2014).

Governance Recommendations

It is a crucial step to link planetary boundaries with human wellbeing, responsibility and a vision of the future in people's minds, as until the state of ecosystems is viewed as a separate, less important concept to human development, sustainable change cannot take place. To strengthen this approach, policies need to favour a conservation strategy that considers the local provisioning services and their effect on local communities. It is suggested that protected areas consider social sustainability through the wellbeing of Malagasy communities and measure the success of conservation efforts based on not only data on biodiversity, but on social indicators. The reason for this is that successful conservation can only be realised if the inhabitants of the given area are also dedicated to the cause and not just act based on detrimental rules imposed on them. As in many places, the identity of the community is rooted deeply in the environment, it is possible to design a bottom-up community-based conservation campaign (Rakotomanana, Jenkins and Ratsimbazafy, 2013), which includes a plan to ensure that local communities are not harmed by conservation policies and encourages them to take part in the efforts.

Such a system could be an improved counterpart of current PES schemes under implementation, keeping in mind that it is crucial to create sustainable economic alternatives. These economic opportunities can be created for example by involving locals in services connected to ecotourism in the country and in the process help them develop infrastructure and employment opportunities (Newsome and Hassell, 2014). People should not be devoid of their rights and properties and follow top-down, government-imposed rules, the details of which are hazy due to the absence of communication. Instead, conservation efforts should utilize the locals' knowledge of and devotion to their environment and establish a clear line of communication between the government, organizations and communities. If policies can create such a system by better outlining how PA systems and their management should be built, the chances of success will increase substantially.

However, it is important to stress that a certain level of centralization of these efforts is necessary, as responsibility being scattered around small organizations, without a clear goal will result in the loss of a comprehensive web of policies and ultimately in a disorganized, panicked attempt to stop biodiversity degradation. For this reason, policymakers need to create clear rules on national and international investment into the conservation efforts in Madagascar (Waeber et al., 2016), establishing a transparent flow of finances which distributes assets to all participants of the programme. This would also help

grounding a global effort to construct a global system of ecosystem conservation efforts conscious of the complex effects of conservation. Such a scheme would incorporate rigorous, internationally cooperative scientific research on biodiversity loss, not only quantifying the risks but also assessing possible outcomes and reviewing their connection to social and economic problems. Madagascar is a place where several issues regarding conservation are perceived in a heightened amount due to the unstable economy based on the exploitation of nature, disadvantaged situation of its inhabitants and the exceptionally valuable, unique biodiversity. Nevertheless, the goal is creating a conservation strategy which can be customised according to the needs and aptitude of the given area, utilizing the power of local agents, but simultaneously establishing a global framework built on a shared discourse on sustainability and the treasuring of biodiversity, facilitating common values and successful biodiversity conservation worldwide.

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