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Madagascar towards 2030: navigating progress and challenges for nature and people

Growing calls within the science-policy arena are calling for doing away with reformist approaches that fail to address the underlying causes of biodiversity loss and engage in an overhaul of how biodiversity conservation is practiced, moving from reform to transformation (IPBES 2024). The urgency of this push stems from the recognition that incremental change under the current business-as-usual trajectory will not deliver the systemic transformation that the global state of the environment needs (Palomo et al. 2024). Madagascar epitomises this situation, particularly given the intricate relation between biodiversity and human development in the country.

Just as the front cover of this year's issue, progress on conservation and development in Madagascar occurs by incremental steps, with the ever-present possibility that a cyclone—or a political crisis, or global pandemic—washes away overnight the hard-won gains painstakingly built. Nearly two decades ago, the MCD journal was launched with the objective of providing a forum to examine the most pressing challenges biodiversity conservation and human development face in the country, while fostering debate on potential solutions. As we enter the second half of the decade and its many conservation and development goals rapidly approaching, it seems pertinent to take stock of the progress of the country. Loosely following the Sustainable Development Goals (SDGs) and the Kunming-Montreal Global Biodiversity Framework (KM-GBF), I will look at several pervading challenges, and distil some innovative ideas proposed recently, which hopefully, can help to make a difference for Madagascar's people and nature in the coming years.

TOWARDS THE SUSTAINABLE DEVELOPMENT GOALS?

While most SDGs have an indirect link to biodiversity conservation in Madagascar, these lines will be devoted to some with a more direct relation. Given that much of forest loss in the country is due to conversion of forest to (subsistence) agriculture (Waeber et al. 2015, Zaehringer et al. 2015), starting with SDG 2 (Zero Hunger) seems appropriate. Undernourishment in Madagascar declined up to the early 2010s reaching a low of 25%. However, it has since risen sharply, now affecting 40% of the population, while daily protein intake has also slightly decreased (FAOSTAT 2024). While the potential of locally-led innovation platforms to drive increases in agriculture performance has been recently highlighted (Audouin et al. 2023), agricultural land productivity in Madagascar remains among the world's lowest (Global Yield Gap Atlas 2024), with little improvement in sight (Dröge et al. 2022). In addition to fish farming, with a long tradition on the island (Angermayr et al. 2023), some promising ideas are being proposed to address the lack of protein intake. For example, cricket and planthopper farming and consumption are being promoted in several regions, harnessing the insect-consumption tradition in the country (Dürr et al. 2020, Borgerson et al. 2022a), while trying to reduce hunting pressure on lemur populations (Borgerson et al. 2022b).

The vast majority of Malagasy people still rely on solid biomass for cooking—charcoal in cities and firewood in rural areas (Montagne et al. 2010). This has serious consequences for both forests across the country (Gardner et al. 2016, Ramarokoto et al. 2024) and human health, as domestic air pollution ranks the second cause of disease in the country (Dasgupta et al. 2015), particularly affecting children and women (Jestin-Guyon et al. 2015). While achieving SDG 7 (Affordable and clean energy) remains distant, inspiring approaches have been tested in the last decades. On the fuel use efficiency side, innovations such as improved stoves or solar cookers (which use no fuel at all)—largely spearheaded by the NGO ADES for over 20 years—can reduce fuel consumption by up to two thirds (Vetter 2006, Andrianaivo and Ramasiarinoro 2014), while improved essential oils stills can cut firewood use by nearly half (Cœur de Forêt 2021). On the supply side, increased efforts have been placed on expanding plantations for fuelwood production (Bucht 2015). However, these initiatives remain at small scale in many regions (Blanco et al. 2019), which calls for increased efforts to harness the potential of this relatively low hanging fruit to reduce forest degradation.

Regarding SDG 8 (Decent jobs and economic growth), GDP per capita has mostly stagnated at around $US500/person during the last two decades, with population living under $US2.15 /day still standing at over 80% (World Bank 2024). Further, the promise of tourism, whose revenue plays a key role in the Malagasy economy (Cooke et al. 2022), was again shuttered by the COVID-19 pandemic and the measures put in place to arrest the spread of the virus across the country. Chiefly, these were the ban on inter-regional movement (Rakotonanahary et al. 2021), and specially the closure of the international borders for 20 months, with subsequent implications for tourist arrivals and related revenue streams (Harisoa and David 2023). Implications for local livelihoods could have been severe, particularly on those populations most relying on tourism and hospitality (Piquer-Rodríguez et al. 2023), exacerbated when impacting on communities reeling by the effect of cyclones or cash crop price crashes (Rakoto Harison et al. 2024). In this way, the relatively small role tourism plays in funding protected areas regarding the budget needed has prompted recent calls for increasing the resilience of protected areas by reducing the dependency on tourism flows that can just be shut down overnight in the event of an unforeseen crisis, as a global pandemic or a national political crisis (Andrianambinina et al. 2023).

Regarding SDG 12 (responsible consumption and production), recent work has underlined agroforestry's role for sustainable development. While crops typically produced under agroforestry regimes accounted for over a quarter of Madagascar's export value in the past 10 years, and provide income for at least half a million farmers (Andriatsitohaina et al. 2024), these systems hold great potential for restoring biodiversity in former shifting cultivation fal-

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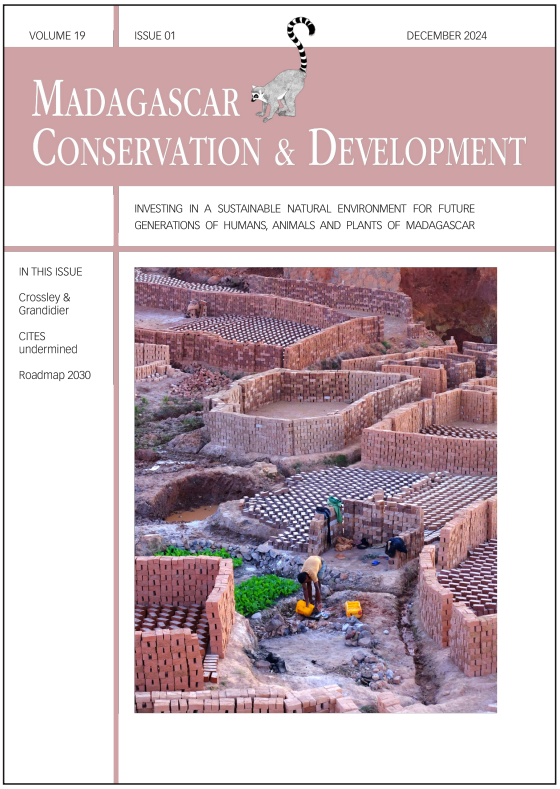

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lows (Wurz et al. 2022). However, scalability of agroforestry remains constrained by deficient infrastructure and consequent limited market access, insecure land tenure discouraging farmers to engage into costly investments to initiate production, or lack of know-how all together, all of which will need to be addressed if agroforestry is to realize its potential to deliver sustainable development for a larger share of Malagasy rural inhabitants. Further, the contradictory impacts the recent vanilla price boom (2015–2019) had on communities and forest alike (Llopis et al. 2019, 2022) should serve as a cautionary tale about the complex governance issues that commercial agriculture at the forest frontier faces in Madagascar, perhaps most starkly illustrated by the Menabe region, witness to one of the most dramatic forest loss processes in recent times (Rasoamanana et al. 2024).

PROGRESS IN CONSERVATION: AFTER AICHI, HEADING TO KUNMING VIA MONTREAL

Although Madagascar missed most of the Aichi targets for 2020 (Ralimanana et al. 2022), the country has made timid progress towards some of the 23 KM-GBF targets for 2030. For example, the share of terrestrial Key Biodiversity Areas enjoying some type of protection increased from 20.4% to 26.6% in the past 20 years, reaching a promising 49.1% in the case of freshwater areas (United Nations 2024). Much of this progress towards KM-GBF Target 3 (conserve 30% of land, waters and seas) is attributable to the Durban vision launched in 2003, leading to the creation of at least 75 new protected areas across all forest ecosystems in the country (Gardner et al. 2018), some of which have played a key role in conserving forests (Papunen and Eklund 2024). However, many of these new protected areas have become 'orphan sites', lacking management on the ground after former managers relinquished their responsibilities (Waeber et al. 2020). Moreover, many of those with actual management are severely understaffed (Rakotobe and Stevens 2024), and underfunded (Eklund et al. 2022), undermining achieving both Target 3 and 1 (plan and manage all areas to reduce biodiversity loss), and proving that Target 19 (mobilizing $200 Billion per year for biodiversity) remains a distant dream. This calls into question the need for further expanding the Malagasy protected area system without first addressing the pervading management issues afflicting the existing conservation schemes.

Madagascar has also seen a threefold increase in the area degraded between 2000–2015 and 2016–2019 (United Nations 2024), making ever more difficult achieving Target 2 (restore 30% of all degraded ecosystems). Despite increasing attention to forest and landscape restoration initiatives in the country (FAO 2024), and the long trajectory of some restoration initiatives (Mansourian et al. 2018), these are mostly yet to bear fruit, not the less because of the complicated tenure issues to be work out in Madagascar to deliver restoration at scale (Rakotonarivo et al. 2023).

Regarding KM-GBF Target 15 (businesses assess, disclose and reduce biodiversity-related risks and negative impacts), recent years have brought surprising findings regarding mining (both industrial and artisanal), traditionally considered a major driver of forest degradation and loss in the country (Eckert et al. 2024), and with potential for severe social implications (Ballet and Randrianalijaona 2014, Zaehringer et al. 2024). For example, efforts to offset the environmental impacts of the largest industrial mining operation on the island might be working (Devenish et al. 2022), although these gains might just vanish if not properly monitored by the State (Hubert Ta and Campbell 2023), or the mining corporation does not perceive economic gains from these activities. However, while overlaps between areas of potential gem occurrence and those with high biodiversity value might pave the road for further conflict between conservation and economic development, the vast majority of areas with gem potential are outside biodiversity-relevant areas (Devenish et al. 2023). Given that the impact of artisanal mining on forests may be less dramatic than once thought, this potential could be tapped for economic community development if, as challenging as it might be, adequate governance structures are devised (Devenish et al. 2024).

Honoring somehow KM-GBF Target 22 (ensure participation in decision-making and access to justice and information related to biodiversity for all), Madagascar is ever more relying on community-based approaches to manage natural resources (Reibelt and Nowack 2015), particularly around newly established protected areas (Gardner et al. 2018). However, community-based forest management initiatives may be subjected to higher pressures than conservation schemes such as national parks when under strain from the recurrent political crises impacting the country and their aftermath, as recently found by Neugarten et al. (2024). Further, despite the role that small scale, locally-led protected areas can play for increasing local sources of income through tourism (Cooke et al. 2022), only the more accessible sites might be capable of reaping these benefits (Rodríguez-Rodríguez et al. 2024).

While the need for strengthening capacity building in conservation (KM-GBF Target 20) has been repeatedly stressed (Eklund et al. 2022, Rakotobe and Stevens 2024), the conditions the COVID-19 pandemic imposed led to developments that allow to extract important lessons for the future of conservation research and practice in the country. The closure of Madagascar's borders implied that most international researchers and practitioners could not travel to Madagascar, forcing conservation and environmental education projects to rely more heavily on local expertise and resources, and local staff stepping into more leadership roles (Razanatsoa et al. 2021). This brought to the fore the urgency to increase the involvement of local communities to build and maintain project resilience in the face of unexpected crises, by improving access to technologies and training, and addressing equity and inclusivity aspects (West et al. 2023).

Finally, enhanced availability and accessibility of knowledge on biodiversity (KM-GBF Target 21) might be an increasing reality for Madagascar, if number of publications serves as an indication. A search conducted on Scopus on 16 December 2024 using the string "Madagascar AND (biodiversity OR "biological diversity")" returned 1,270 items (beginning in 1974), with increasing numbers from 11 records in 2000 to 96 in 2024. Importantly, half of these publications were published Open Access, also incrementally (from 27% in 2000 to 69% in 2024), and critically, with a third of all publications featuring authors with Malagasy affiliations, again with increasing frequency (from 27% to 47%). In parallel, the articles published from 2006 by MCD (not listed in Scopus) were 183, showing that this journal has been and remains a vital platform for exploring Madagascar's conservation challenges and advance innovative solutions for them.

WHICH WAY FORWARD THEN?

Madagascar's many challenges will not be solved overnight and with one-size-fits-all solutions, but from the array of approaches recently proposed, some that may be worth exploring

are the following. For example, the feasibility of a conservation basic income is being currently assessed in northeast Madagascar (Wyss Academy 2024). This type of direct cash transfer aims at reducing the need to engage in environmentally destructive activities (de Lange et al. 2023) is gaining popularity among conservationists (Sheehan and Martin-Ortega 2023). While not yet tested at scale, its implementation could mark the beginning of a new era in conservation practice, where poverty alleviation and biodiversity protection are pursued simultaneously through socially equitable mechanisms. Similarly, as challenging as it may be governance-wise, schemes that allow local communities benefit from a well-regulated wildlife trade (Ganzhorn et al. 2014), as well as from the mineral reserves under their lands (Devenish et al. 2023), should be explored. Further, transparency about and accessibility to evidence on project outcomes—monitored through rigourous impact evaluation—should be increased, so we can learn about what works and under which conditions, and particularly what does not, and what went wrong in each occasion, so the very limited funding available for conservation and development is used wisely. Finally, the recent pandemic has shown us that the current models of mostly Global North-led conservation and development interventions are not only unequitable, but also not fit to face the crises that so often sever flows of people and resources between Madagascar and North-based organisations. With increasing numbers of students in the country choosing conservation-related disciplines, the new generation of Malagasy researchers and practitioners is probably the best prepared of all times to take leadership positions across all organisational levels. This transition will also require a fundamental shift in how research partnerships are structured and funded, moving away from extractive models that perpetuate dependencies towards genuinely equitable collaborations (Rakotonarivo and Andriamihaja 2023).

So the critical question remains: what will Madagascar's path towards 2030 look like? Will the last events in Madagascar be the catalyst for systemic change we were waiting for, or will business-as-usual be the path we continue to follow? The stakes for people and nature in Madagascar could not be higher. It is crucial that we choose the next actions wisely, so that, together, we can ensure the lessons of the past guide us towards a sustainable and inclusive future.

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Figure 1. The 17 Sustainable Development Goals (top) and the 23 Kunming-Montreal Global Biodiversity Framework targets (bottom).

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