PROJECT PERFORMANCE ASSESSMENT REPORT

MADAGASCAR

Third Environment Program Support Project

Report No. 158221

APRIL 22, 2021

IEG Independent Evaluation Group | WORLD BANK GROUP World Bank • IFC • MIGA

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THIRD ENVIRONMENT PROGRAM SUPPORT PROJECT
(IDA-49650, IDA-H0870, TF-93177)

April 22, 2021

Financial, Private Sector, and Sustainable Development

Independent Evaluation Group

Abbreviations

AF	additional financing
CAZ	Ankeniheny–Zahamena forest corridor
CDA	community development activity
COFAV	Fandriana–Vondrozo forest corridor
EP	Environment Program Support Project
EP3	Third Environment Program Support Project
ICR	Implementation Completion and Results Report
IDA	International Development Association
IEG	Independent Evaluation Group
IUCN	International Union for Conservation of Nature
M&E	monitoring and evaluation
MNP	Madagascar National Parks
NEAP	National Environmental Action Program
NGO	nongovernmental organization
OP/BP	Operational Policy / Bank Procedure
PA	protected area
PDO	project development objective
PPAR	Project Performance Assessment Report
PSDR	Rural Development Support Project
SAPM	System of Protected Areas of Madagascar
ToC	theory of change

All dollar amounts are US dollars unless otherwise indicated.

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This report was prepared by Joachim Vandercasteelen and Timothy Healy, who assessed the project in September 2020. The report was peer reviewed by Neal Hockley and panel reviewed by Lauren Kelly. Viktoriya Yevsyeyeva provided administrative support.

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Project Data

This is a Project Performance Assessment Report (PPAR) by the Independent Evaluation Group (IEG) of the World Bank Group on the Madagascar Third Environment Program Support Project (P074235). This instrument and the methodology for this evaluation are discussed in appendix C. Following standard IEG procedure, copies of the draft PPAR were shared with relevant government officials for their review and comment. The Ministry of Agriculture provided the comments, which are attached in appendix E.

Basic Data

Country	Madagascar	World Bank financing commitment	$40.0 million (original IDA grant), $9.0 million (GEF), and $52.0 million (total AF)
Global Practice	Environment and Natural Resources	Actual project cost	$200.0 million
Project name	Third Environment Program Support Project	Expected project total cost	$148.9 million
Project ID	P074235, P074236 (GEF), P107484 (additional financing)	Actual amount disbursed	—
Financing instrument	Specific investment loan	Environmental assessment category	B
Financing source	IDA-49650, IDA-H0870, TF-93177		

Note: AF = additional financing; GEF = Global Environment Facility; IDA = International Development Association; — = not available (para. 1.13 explains why this information is not available); TF = trust fund.

Dates

Event	Original Date	Actual Date
Approval	05/11/2004	05/11/2004
Effectiveness	10/21/2004	09/13/2014
Restructuring		04/01/2008 01/12/2009 12/18/2009 06/15/2011 10/12/2011 05/28/2013 02/26/2014 06/30/2014 11/30/2014 12/20/2015
Mid-Term Review	07/13/2007	07/13/2007
Closing	12/31/2009	12/31/2015

Key Staff Responsible

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Summary

Project Background and Description

The closure of the Third Environment Program Support Project (EP3) brought an end to the World Bank's programmatic series of loans to implement the Madagascar National Environmental Action Program (NEAP). The Madagascar NEAP—implemented between 1990 and 2015—aimed to "reconcile the population with its environment to achieve sustainable development" (MEWF 1990, 2) by simultaneously conserving the country's critical biodiversity and improving the livelihoods of local communities dependent on natural resources. The World Bank's programmatic series of loans to implement the NEAP is considered a flagship program because of the focus on its long-term objective of biodiversity conservation, depth of financing, innovations introduced, and the convening role played by the World Bank in coordinating donor support.

The Project Performance Assessment Report (PPAR) provides an opportunity to assess how the World Bank, through EP3, has contributed to the higher-level NEAP goals of biodiversity conservation and human development. Building on the World Bank's earlier engagement in the NEAP, the EP3 was launched in 2004 to provide environmental support at the field and policy level in Madagascar. The EP3 attempted to mainstream environmental policy into the wider macroeconomy by making environmental sustainability a key objective in sector laws and policies. The project focused on expanding the coverage and improving the management of the System of Protected Areas of Madagascar (SAPM), which received strong support in 2003 when the government of Madagascar committed to the Durban Vision to triple the coverage of protected areas (PAs). The expansion of the SAPM required sustainable financing mechanisms, and the EP3 supported the creation of the Madagascar Foundation for Protected Areas and Biodiversity in 2005. The EP3 envisioned that by protecting mainly forest habitats in PAs, the project would simultaneously contribute to biodiversity conservation and human development. The latter objective would result from tourism and other benefits PAs provide to local communities that would incentivize sustainable farming practices and help drive the sustainable development of the local economy.

Based on the lessons from earlier phases of the Environment Program Support Project (EP), the EP3 prioritized support for biodiversity conservation. The experiences from earlier EP phases demonstrated that a project designed to simultaneously address the complex interplay of environmental degradation and rural poverty was unrealistic given the limited local implementation capacity. As a result, the EP3 project design prioritized the management of biodiversity conservation at the field and policy levels. Moreover, the EP3 relied on other rural development projects supported by the World Bank to finance and implement community development activities (CDAs). The Ministry of

Environment and Ministry of Agriculture signed a memorandum of understanding to ensure coordination of the World Bank–funded projects. Besides these development activities, the EP3 envisioned that benefits from the EP3 support for tourism development would trickle down to local communities through ecotourism opportunities.

The EP3 went into effect in 2004 and ended in 2015; it required a total budget of approximately $200 million from multiple donors. The International Development Association and the Global Environment Facility allocated $82 million and $19 million to the actual financing of the EP3, respectively. Other donors (and the borrower) committed to financing $100 million, but their actual financing is unknown (as discussed in para. 1.13). As the last phase of the programmatic series, the EP3 was initially designed as a five-year project and the original closing date was 2009. However, the project was restructured multiple times and closed in December 2015.

The design of the EP3 was intermittently simplified and mainly focused on field-level biodiversity conservation to address the risks posed to project completion due to the unstable political situation in Madagascar. When a political coup was staged in 2009 and Operational Policy / Bank Procedure 7.30 (Dealing with De Facto Governments) was applied, disbursements were temporarily put on hold for all projects. An exception was granted to the EP3 on the grounds that suspension of its project activities would effectively terminate environmental protection for approximately one-third of Madagascar's PAs. The project focused its support on a limited number of activities linked to PA management. The political instability continued beyond 2011, and the project received additional financing (AF) to avoid having critical PAs lose environmental protection and to support local communities whose livelihoods were affected by the creation of new PAs. The project activities were revised accordingly during the AF phase to focus project support on (selected) PA management and local community development.

Results

This evaluation focuses on the overall effectiveness of EP3's simplified and revised objectives and outcomes regarding improved biodiversity conservation and livelihoods. In particular, the PPAR focuses on EP3's support for the establishment or extension of PAs to reduce deforestation. It tests the project assumptions that the critical PAs supported by the project can reduce deforestation. The PPAR also assesses how the EP3 supported communities through CDAs.

Methods. To assess effectiveness, the PPAR relies on geospatial data complemented by insights from household-level data. The geospatial data allow rigorous measurement of deforestation rates over time and identification of the (heterogeneous) effects of project support. The evaluation also uses secondary information from households in several villages surrounding one of the new PAs to derive explanatory factors that help the evaluation authors interpret the geospatial findings. The PPAR draws on the extensive literature on the environmental sector in Madagascar and on interviews with key stakeholders (see appendix C, Methods and Evidence).

The EP3 contributed significantly to the expansion of PA coverage in Madagascar but did not achieve the required financial and institutional sustainability for PA management. During the project's timeline, the area covered by PAs increased fourfold, achieving the project's target to increase the surface of PAs to 5 million hectares. The EP3 supported a third of the total PA coverage and 60 percent of the PAs managed by Madagascar National Parks (MNP). The EP3 also ensured that donors, environmental nongovernmental organizations, and other stakeholders in the environmental sector were collaborating under a single framework during a period marked by political instabilities. However, the right institutional capacity and sufficient financial resources were not in place to support the dramatic expansion of the PA network. To date, the annual revenues generated by MNP and the biodiversity fund are largely insufficient to cover the annual management cost of the MNP-managed PAs and the required compensatory payments to communities within new PAs. Therefore, the SAPM has remained highly dependent on external support to fund the recurring operational costs, which undermines its sustainability.

The increased placement of forest habitat under PAs in the EP3 did not result in the envisioned reduction of deforestation rates. The analysis of geospatial data available on forest cover shows that the change in deforestation rates (before and after the project) is not statistically different between project PAs and nonproject PAs. Thus, the EP3 support has not been able to curb deforestation rates more effectively than other support models to PAs. Instead of decreasing, deforestation rates increased over time for both groups of PAs. The geospatial analysis highlights significant heterogeneity in the project's ability to reduce deforestation rates depending on the climate and management model of the PA. In the humid zones of eastern Madagascar, the average change in deforestation rates is between two and five times higher in project PAs than in nonproject PAs. As most project PAs are located there, the EP3 had overall limited success in reducing deforestation rates.

Failure to address the decline in agricultural productivity over time around PAs is a likely explanatory factor for the observed trend in deforestation rates. PAs are under immense pressure from declining productivity of staple crops, reduced fallow periods, and growing populations. Farming, and especially shifting cultivation for subsistence crops, is both the most important rural livelihood activity and the most important driver of deforestation. The PPAR analyzes whether the differential project effectiveness is related to the underlying drivers of deforestation and how the EP3 addressed these factors. The analysis of geospatial production estimates on land immediately outside PAs shows that the decrease of rice yield over time in the humid climate zone of Madagascar is much more pronounced in project PAs than nonproject PAs. This suggests that the EP3 did not address the decline in agricultural yields around PAs and that larger decreases in agricultural productivity are associated with increased deforestation rates.

Local communities surrounding PAs did not see their livelihoods restored as a result of project support and maintained unsustainable human behavior within and around the PAs. The EP3 supported the agricultural livelihoods of local communities through World Bank environmental and social safeguard and nonsafeguard activities. The CDAs of the EP3 reached less than half of the intended beneficiaries, most of whom expressed dissatisfaction with the compensation activities through project surveys. The PPAR analyzes secondary data on the incomes of households located in villages supported by safeguard activities and villages without support and finds no significant difference between the two groups of households. Moreover, a comparison of geospatial data on the frequency of forest fires (between villages that received livelihood support and those that did not) does not provide evidence that livelihood support reduced forest fires. Hence, available evidence suggests that safeguard implementation neither restored rural livelihoods nor reduced human pressure on forests.

Design and Preparation

Although the original EP3 design was overly complex and ambitious, the simplified design—focusing narrowly on field-level conservation—undermined EP3's ability to provide important institutional capacity support and policy mainstreaming. The original EP3 design was too broad in scope and geographic implementation. It also had complex objectives and overambitious targets, supported by a weak monitoring and evaluation system to generate evidence. Similar design issues had compromised the effectiveness of the precursor EP projects, showing that learning within the programmatic series was limited. After the political coup in 2009, the project increasingly steered support away from institutional capacity building toward the field-level management of targeted PAs. This change marked a departure from one of the primary objectives of the NEAP—namely, to strengthen governmental and parastatal environmental agencies in Madagascar. As a result, to date, the financial and institutional resources are insufficient to manage the SAPM efficiently and sustainably.

The support for field-level biodiversity protection was guided only by the intrinsic biodiversity conservation value of PAs instead of the underlying drivers of biodiversity losses, especially human development activities. The project PAs contained more forest and critical species than nonproject PAs and, thus, required protection from a purely biodiversity perspective. However, project and nonproject PAs are not different in terms of deforestation drivers linked to human behavior. This finding suggests that addressing the root causes of deforestation did not drive the selection of PAs to be protected under EP3. This prioritization of biodiversity hot spots for project support is in line with the historical imbalance in the NEAP that favors biodiversity conservation activities over human development activities. The NEAP was designed and implemented by environmental conservationists with little understanding or appreciation of the socioeconomic realities and resource-use patterns of local communities. By assigning the responsibility to implement livelihood activities to another World Bank rural development project, the EP3 eliminated human development activities from the original project design. However, any field-level intervention to protect forest resources from deforestation is unlikely to be effective when the human pressures on these forest resources are not considered.

Implementation and Supervision

The implementation of safeguard and nonsafeguard activities in the AF to support the livelihoods of local communities did not work as planned. The decision to rely on accompanying rural projects to finance and implement CDAs might have been a sound decision at appraisal given the limited financial resources and earlier NEAP experiences. However, because coordination mechanisms between the different World Bank projects were not established, none of the CDAs were implemented by the rural development projects. AF was used to restructure the EP3 project and to directly finance safeguard activities (primarily improved agricultural practices) and nonsafeguard activities (capacity building of local communities to manage natural resources). However, the implementation of several safeguard and nonsafeguard activities was temporarily suspended because of ineligible expenses, procurement anomalies, and potential fraud in service provider contracts. Moreover, the procedures to identify eligible households for project support did not work properly, and most beneficiaries were not compensated during the original timeline of the AF (and the project had to be extended).

Safeguard activities were unable to compensate forest-dependent communities for the restricted access to forest resources and did not incentivize these communities to sustainably manage forest resources. The comparison of geospatial data between villages that received EP3-safeguard support and those that did not shows insignificant differences in agricultural incomes and frequencies of forest fires. Moreover, academic evidence confirms that the one-time safeguard compensation to eligible households was largely inadequate and insufficient to compensate for the income loss from the long-term restricted access to forests. Local communities perceived the value of safeguard activities received as equivalent to the *annual* opportunity cost of restricted forest access.

Safeguards compensated for less than 5 percent of the long-term loss in income (Poudyal, Rakotonarivo, et al. 2018).

By design, social safeguards are inadequate instruments to induce long-term changes in the livelihood incomes and human behavior of an entire community. Safeguard activities are intended to compensate eligible households for the livelihood lost because of their restricted access to natural resources. As safeguards aim to achieve, at a minimum, a no net loss, the safeguard activities do not necessarily aim to introduce long-term improvements in beneficiaries' income. However, the EP3 safeguards even failed to properly compensate households for restricted access to forest resources. Not only are communities worse off compared with no project support, it is likely they become skeptical and averse to social safeguards, thereby jeopardizing future attempts to restrict forest access. In Madagascar, supporting local communities through safeguards that target individuals was not aligned with the communities' cultural and social norms and the harsh reality of everyday rural life. While it is notoriously difficult to identify eligible beneficiaries and understand the dynamics of remote communities, improperly designed safeguards can trigger social tension when nonbeneficiaries are only slightly better off compared with households eligible for safeguard support. A generic approach to safeguards suggests that the safeguard activities included in the AF seemed a necessity to comply with the safeguard plan rather than an opportunity to introduce long-term improvements in people's livelihoods. It is, therefore, not surprising that the EP3 did not induce positive behavioral change that would eventually lead to reduced deforestation.

The time-limited support for agricultural production does not address the fundamental drivers of unsustainable forest-resource management and does not introduce the desired behavioral change beyond the project's timeline. The safeguard activities provided simple, one-time, and supply-side support to improve the dominant agricultural activities of beneficiaries. However, these support activities did not address the fundamental problem of low soil fertility that forces farmers to cut the forest. Many safeguard activities were not tailored or adapted to the complex farm realities, and they were not equipped to counter existing spiritual beliefs about unsustainable farming practices. As well, farmers lacked the knowledge to adopt alternative technologies. Farmers expressed low satisfaction and abandoned the new technologies after the safeguard activities to compensate for the opportunity costs incurred during the project were over. In the long term, supply-side support does not provide the needed incentives for the transition toward more intensive, alternative, and sustainable agricultural production systems in the absence of markets. Moreover, given the remoteness, localized land pressure, and limited market integration, households will have to be provided with the opportunities and the business environment to diversify away from unsustainable agricultural practices.

Independent Evaluation Group project ratings are described in appendix A. The overall outcome of the EP3 is rated **moderately unsatisfactory,** based on the ratings of **substantial** for relevance, **modest** for efficacy, and **modest** for efficiency. This rating reflects the additional evidence from the Independent Evaluation Group's assessment of geospatial data, secondary household-level data, academic and policy literature, and qualitative information from interviews with key stakeholders. The evaluation methodology and evidence sources are described in appendix C.

Lessons

This assessment offers the following lessons:

- **A project designed and implemented with a narrow focus on the protection of biodiversity resources without addressing the underlying human pressures on those resources is unlikely to achieve the long-term goal of biodiversity conservation.** The NEAP intended to achieve the joint objectives of biodiversity protection and the improvement of community livelihoods. The EP3 narrowly supported the former objective by expanding the coverage and supporting the management of the PA system. Although this reflected an important lesson from earlier EPs—namely, that a single project cannot simultaneously achieve multiple higher-level objectives—it conflicts with another program lesson: that failing to consider the human pressures on biodiversity resources undermines the effectiveness of any field-level intervention to promote biodiversity protection. Because the EP3 activities did not directly support local communities, the root causes of biodiversity degradation in this case were not addressed, and the project was not successful in reducing deforestation rates (compared with other support models). The conservation of biodiversity within PAs has not been an engine of sustainable economic development in Madagascar.
- **When PAs restrict the long-term access of rural households to forest resources that are indispensable for their livelihood, safeguard activities are inappropriate instruments for promoting the sustainable use of forest resources in the long term.** Time-limited and supply-side safeguard activities that compensate individuals for lost livelihood are not the best tools to incentivize the sustainable management of forest resources by the entire community, in remote locations, and in the longer term. Safeguards have expensive, ineffective, and time-consuming targeting procedures and can create social tension between eligible and ineligible poor households. But even for those households targeted by the safeguard activities, beneficiaries perceive the value

of compensation as often insufficient and safeguard activities as not adapted to the complex farm realities. Finally, safeguard activities are—by design—not the instruments to introduce long-term improvements in the livelihoods of recipients. A simple, one-time, and supply-side support for the dominant agricultural activities does not address the fundamental problem of low soil fertility that is a major contributor to deforestation in Madagascar.

- **Any intervention supporting the conservation of biodiversity in Madagascar is likely to be ineffective without complementary efforts to improve the policy environment that shapes incentives for sustainable biodiversity resource management.** The policy environment (norms, rules, and procedures) for land tenure, forest governance, and market participation determines the incentives of individuals to sustainably manage biodiversity resources. Insecure land tenure, weak enforcement of forest regulation and governance, and vast rural landscapes with poorly developed marketing and transportation systems undermine investments in soil fertility and other sustainable agricultural practices. The effectiveness of policies introducing sustainable management practices is further eroded by corruption, repeated political crises, rent-seeking behavior, and the capturing of benefits by selected groups of local elites. Hence, for any field-level intervention to effectively incentivize sustainable resource management by households in the forest frontier, a favorable higher-level regulatory framework, structural investments along the entire value chain, and a stable macropolitical environment are needed.

- **The overarching objective of a programmatic series to support higher-level development objectives around biodiversity conservation is undermined when design issues, such as overambition and complexity, persist across all projects in the series.** A programmatic series, such as the EPs, is intended to implement a series of projects that build on and learn from project experiences and to install long-term commitments to higher-level development outcomes. However, all three EPs to implement the NEAP had to be scaled down during implementation because of the complex and overly ambitious design with unrealistic objectives in combination with a challenging political environment. In each EP, such design issues, combined with a poor monitoring and evaluation system that lacked indicators to track long-term project impact, reoccurred and undermined the credibility and field-level impacts of a biodiversity project with long-term objectives.

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1. Project Background, Context, and Design

Background and Context

1.1 The closure of the Third Environment Program Support Project (EP3) and its additional financing (AF) brought an end to the World Bank's 25-year commitment to support the implementation of the Madagascar National Environmental Action Program (NEAP). The Madagascar NEAP was originally launched by the government of Madagascar in 1991 to "reconcile the population with its environment to achieve sustainable development" (MEWF 1990, 2). Specifically, the NEAP sought to conserve the country's critical biodiversity, which—as a driver of the local economy—would improve the livelihoods of local communities dependent on natural resources. A broad consortium of multilateral and bilateral donors, international and transnational environmental nongovernmental organizations (NGOs), private foundations, and the private sector joined forces in a single framework to fund and support the implementation of the NEAP, throughout its three phases (World Bank 2013).

1.2 The World Bank's programmatic series of loans in support of the NEAP is considered a flagship program for the World Bank's engagement in the environmental sector. First, recognizing that the goal of achieving biodiversity conservation and addressing the irreversible loss of biodiversity requires long-term support, the World Bank made a commitment to support a three-phase, programmatic loan series, with the intention that each phase would build on—and learn from—the prior phase. Such a programmatic series was pioneering for the World Bank's engagement in the environmental sector, especially in a low-income country like Madagascar (at project appraisal, the EP3 was the largest grant ever awarded by the International Development Association [IDA] to an environmental project). The three phases of the program allocated an unprecedented depth of resources to support environmental policy making in Madagascar and the operationalization of the first NEAP in Africa. Second, the World Bank played an important convening and facilitation role: It helped coordinate donors and align their interests with those of the government of Madagascar, following the priorities outlined in the NEAP. Third, the program was innovative. The EP3 was the first project to use an IDA grant to capitalize an endowment fund that would support the financial sustainability of biodiversity conservation.

1.3 The Project Performance Assessment Report (PPAR) thus provides an opportunity to assess how the World Bank, through EP3 and the precursor phases of the Environment Program Support Project (EP), has contributed to the higher-level NEAP goals of biodiversity conservation and human development. Building on the World Bank's earlier engagement in the NEAP, the EP3 was launched in 2004 to consolidate the achievements of its two previous phases. Since the majority of Madagascar's unique and highly endemic biodiversity resides in forests, Madagascar's main approach to protecting its biodiversity has been to place forests within terrestrial protected areas (PAs). The EP3 focused on expanding the coverage and diversity of Madagascar's PA system previously supported by the EPs.[1] Moreover, the EP3 focused on mainstreaming environmental policy into the wider macroeconomy to prepare the country for the post-NEAP area. The project also posited that the protection and conservation of Madagascar's unique biodiversity at the field and policy level would benefit the livelihoods of local communities dependent on forest resources.

1.4 The coverage and management of the system of PAs got a substantial boost in 2003 when the government of Madagascar committed to the Durban Vision to triple the coverage of PAs to over 6 million hectares. Before the EP3 came into effect, the System of Protected Areas of Madagascar (SAPM) contained 46 PAs covering 1.7 million hectares of land. These terrestrial PAs were centrally managed by the parastatal National Agency for Protected Areas Management (which was later renamed to Madagascar National Parks, MNP). PA access was restricted to biodiversity conservation and recreational purposes. When the government of Madagascar announced its Durban Vision in 2003, the government committed to tripling the existing share of land covered with PAs from less than 3 percent to 10 percent, as recommended by the International Union for Conservation of Nature (IUCN). The Durban Vision also introduced alternative management models: NGOs would promote the establishment of new PAs and introduce more flexible forms of governance that would include local communities in comanagement.[2] With the impressive expansion of the SAPM came the need for ensuring sustainable financing mechanisms. As a result, the Madagascar Foundation for Protected Areas and Biodiversity was created in 2005 as a trust fund for the sustainable financing of PAs.

1.5 The EP3 envisioned that promoting biodiversity conservation would simultaneously contribute to human development. By supporting PAs, EP3 assumed that conserving forest habitats would generate sufficient benefits to local communities and help drive the sustainable development of the local economy. The approach was developed to try to address the otherwise unsustainable farming behaviors that were locking forest-dependent communities into a poverty trap of continued deforestation, low-productivity agriculture, and poor livelihoods (World Bank 2015a). For example, poverty rates in Madagascar—as measured by the poverty headcount ratio at $1.90 a day (2011 purchase power parity)—increased from 64 to 78 percent between 2000 and 2012.[3] Poverty in Madagascar is often concentrated in those regions (the southwest, the eastern coast, and the central highlands) with the highest rates of land degradation, deforestation, and soil fertility losses (World Bank 2015a). From 2000 to 2014, Madagascar lost nearly a million hectares of forest, and deforestation rates accelerated over time (Vieilledent et al. 2018).

Objective, Design, and Financing

Objectives

1.6 At appraisal, the EP3 had four ambitious objectives designed to be implemented at the field and policy level. The project development objectives (PDOs) from the development grant agreement were "to improve the protection and sustainable management of critical biodiversity resources at the field level, mainstream conservation into macroeconomic management and sector programs, and facilitate the establishment of sustainable financial mechanisms for the environment, thus contributing to the improvement of the quality of life of the population (World Bank 2004a, 24)." The PDOs were revised during an AF in 2011 to a single objective: "to enhance the protection and sustainable management of targeted protected areas (World Bank 2011, vii)." The global environment objectives from the trust fund grant agreement were identical to the original PDOs and not revised later.

1.7 The EP3 objectives at appraisal to provide environmental support at the field and policy level in Madagascar were relevant to the NEAP's objective. The original objectives of the EP3 contributed to the higher-level objective of the NEAP to reconcile Madagascar's population with its environment. The NEAP had a comprehensive objective to establish a policy, institutional, and regulatory framework to manage the environment in Madagascar and address the root causes of its degradation. More specifically, the EP3 contributed to the NEAP subobjectives to sustainably manage natural resources, conserve biodiversity resources, and improve rural livelihoods.[4] The EP3 focused on mainstreaming conservation and environmental policy making into the macroeconomy and other rural sectors. The EP3 objectives of environmental protection were also in line with the earlier Country Assistance Strategies; the latest Systematic Country Diagnostic (World Bank 2015a) and Country Partnership Framework (World Bank Group 2017); and earlier projects of the World Bank in Madagascar.

Original Design and Implementation Arrangements

1.8 The implementation of the NEAP objectives required action across several sectors and actors in the rural landscape. The first phase of the EP (EP1 from 1990 to 1995) established the foundations for environmental management in Madagascar through establishing the required environmental institutions at the national level and developing the human resources within those institutions. It further supported the expansion and management of the SAPM and piloted Integrated Conservation and Development Programs. All these efforts made a substantial contribution to the country's foundation for environmental policy making, management, and regulation. The second phase of the EP (EP2 from 1996 to 2000) initiated a process of decentralization, regionalization, and participation. The EP2 decentralized conservation management by supporting in-the-field activities of community-based natural resource management.

1.9 Based on the lessons learned from these earlier EP phases, project activities in the EP3 prioritized support for biodiversity conservation. Box 1.1 discusses how the experiences from the approaches pursued during the EP1 and EP2 influenced the design of EP3. Their evaluations showed that a project designed to simultaneously address the complex interplay of environmental degradation and rural poverty was unrealistic given the limited implementation capacity. The NEAP discontinued the Integrated Conservation and Development Programs introduced in the EP1 because activities were poorly targeted and limited in scale, therefore providing limited benefits to local communities. Similarly, the livelihood activities supported in the EP2 had limited impacts in the field because efforts were spread too thinly across the rural sectors (World Bank 2004c). As a result, the EP3 project design prioritized the management of biodiversity conservation at the field and policy level.

Box 1.1. Selected Lessons from Earlier AP Phases That Informed the Design of EP3

During the three decades the NEAP was implemented in Madagascar, donors have tested and learned from different approaches to biodiversity conservation that have implications for and informed the design of the EP3 (and environmental programs globally). Some of the most innovative approaches introduced by the EPs in the NEAP include the ICDPs piloted by the US Agency for International Development, and the community-based natural resource management within the wider approach to decentralization of forest management. This box describes the lessons learned from implementing these approaches in the NEAP and how it informed the design of the EP3.

The ICDPs were poorly targeted, were too limited in scale, and resulted in limited conservation benefits. As part of the NEAP, the US Agency for International Development promoted ICDPs since the early 1990s to support the health, education, and livelihood activities of households on the border of PAs. However, after evaluations found that ICDP initiatives were poorly targeted, were too limited in scale, and resulted in limited conservation benefits, ICDPs were disbanded in the second phase of the EP. The ICDP activities were add-ons to the conservation objectives to dissuade local communities from deforesting. However, mainly privileged people—mostly scientists, tourists, and operators—benefited from PAs, with limited and inadequate job creation opportunities for local communities around the PAs. The activities promoted under the ICDP were not adapted to farm realities and favored richer households, whereas more vulnerable and marginalized people living in deep poverty were excluded from access to forests. There was also a virtual exclusion of the private sector. Most importantly, the ICDP projects underestimated the scale required to support local communities.

The NEAP shifted focus to wider landscapes because of the disappointing ICDP results and the growing awareness that much of Madagascar's biodiversity resources remained unprotected outside PAs and were poorly protected by land-use regulations. The ecoregional landscape approach recognizes the multiple land types, land uses, and livelihood constraints in the different zones of the landscape. Upstream in the landscape, PAs hold potential tourism benefits but also act as an important catchment to provide irrigation water downstream. In return, the approach expects downstream land users to pay for environmental and ecosystem services that protect PAs. Moreover, many issues that affect forest management originate from inconsistencies in official and traditional (customary) regulation of land use. Historically, the state owns forests, and—in theory—only the state can manage forests. In reality, traditional norms (*fady*) and regulations (*dina*) for customary resource management affect forest management at the local level. The state weakly enforced forest-resource management, which resulted in a de facto open access to forests.

Therefore, the second phase of the EP transferred natural resource management to local communities and promoted the participation of local communities in conservation. EP1 underestimated the role and capacities of local authorities because the project relied on centralized government institutions, deconcentrated services of the central administration, and parastatal organizations. Therefore, the EP2 introduced the concept of community-based natural resource management in 1996 through forest management contracts called La Gestion Locale Sécurisée. These contracts allowed the transfer of limited user rights to local communities but no title or ownership right. A formal contract stipulated the regulations for subsistence use of resources in a management plan. In 2001, the simplification of La Gestion Locale Sécurisée contracts for comanagement of forest with community resulted in La Gestion Contractualisée des Forêts contracts signed with forestry management groups.

However, the decentralization of forest management did not improve household livelihoods nor biodiversity protection. In general, despite the simplified contracts, the process to get the contract signed remained complicated, and few contracts passed the review process to be effectively implemented. The World Bank commissioned a series of impact evaluations to assess the effectiveness of community-based natural resource management. These evaluations found that the decentralization of forest management did not improve household living standards (measured by household consumption expenditures and subjective welfare) or improve biodiversity protection (measured by reduced deforestation rates). The membership in community management groups was often captured by local and educated elites. Hence, as the majority of villagers were not involved in decision processes, these community groups did not represent the needs and interests of the entire community. The contracts restricted access to forest resources that had been de facto open access without providing alternatives and enforcement mechanisms for communities. Implementation was top-down, and enforcement of regulations under the contract was challenging. In reality, these contracts resulted in intracommunity tensions and disruption of traditional regulations for natural resource management.

Sources: Erdmann 2010; Freudenberger 2010; Jones et al. 2019; Kull 2004; Pollini 2011; Razafindralambo and Gaylord 2008; Rasolofoson et al. 2015; Rasolofoson et al. 2017; World Bank 2013.
Note: EP = Environment Program Support Project; ICDP = Integrated Conservation and Development Program; NEAP = National Environmental Action Program; NGO = nongovernmental organization; PA = protected area.

1.10 The original project design expected to achieve the four PDOs by supporting three project components. First, the Forest Ecosystems Management component supported the Ministry of Environment, Water, and Forests in the management of national forests mostly by strengthening forest governance, the management of conservation sites, and the transfer of forest management rights to local communities.[5] After the Mid-Term Review, the first component was split into two: Forest Ecosystem Management and Mitigation of Natural Resource Degradation; and Strengthening Governance and Effectiveness of the Environmental and Forestry Administration. The former component supported sustainable forest use, fire control, and reforestation activities; the latter component supported the core functions of the Ministry of Environment in forestry governance and administration. Second, the Protected Areas Management component directly supported the management of PAs by building up local and institutional capacity and by promoting their financial sustainability through the endowment of a biodiversity foundation. This PA-focused component accounted for nearly half of the initial budget of EP3 (see appendix A). Specifically, the design of the EP3 financially supported 29 PAs.[6] Finally, the Environmental Mainstreaming component aimed to improve the public knowledge and information about environmental conservation, improve environmental legislation and regulation, and support environmental units in all sectoral ministries. Table A.1 in appendix A provides a more detailed overview of the different project components.

1.11 The EP3 relied on other rural development projects supported by the World Bank to finance and implement community development activities (CDAs). Because the EP3 created or extended PAs, the Ministry of Environment, Water, and Forests and the National Agency for Protected Areas Management prepared an Environmental and Social Management Framework and Process Framework in 2003. As a result, the project prepared social safeguard plans for each of the PAs stipulating CDAs to mitigate the impact of restricting access of local communities to forests. However, as the EP3 had no resources to implement CDAs, it was decided that the NEAP (projects) would focus on biodiversity conservation while the Action Plan for Rural Development (projects) would focus on increasing productivity through agricultural intensification. Hence, the EP3 design assumed that all CDAs under its social safeguards were to be funded and implemented by other rural World Bank projects, of which the Rural Development Support Project (PSDR is the French abbreviation) was the most important.[7] Further, the EP3 implicitly envisioned that benefits from the project's support for tourism development would trickle down to local communities through ecotourism opportunities.

1.12 The EP3 was designed to be implemented by different government and parastatal agencies. The Ministry of Environment, Water, and Forests coordinated the EP3 activities, but different agencies were responsible for the implementation of individual project components. The Department of Water and Forests implemented the

Forest Ecosystems Management component; the Department of the Environment and the National Office of the Environment implemented (aspects of) the Environmental Mainstreaming component. The National Agency for Protected Areas Management implemented the Protected Areas Management component. A Project Coordination Unit (locally called Cellule de coordination de PE3)—established in the ministry—assisted the implementing agencies in executing project activities (financial management, procurement, safeguards compliance, monitoring and evaluation [M&E], and reporting) at the operational level (World Bank 2004d).

Financing and Project Restructuring

1.13 The multiple donors spent $200 million on EP3, which amounts to nearly half of the total budget allocated to the NEAP ($450 million). Donors allocated approximately $450.0 million to implement the NEAP through the EP1 ($100.0 million), EP2 ($150.0 million), and EP3 ($200.0 million). The total EP3 financing estimated at the time of appraisal was $148.9 million. The majority of this financing ($119.7 million) was composed of grants from IDA ($40.0 million), the Global Environment Facility ($9 million), and the United Nations Development Programme ($6.3 million); and bilateral funding from the United States Agency for International Development ($27.7 million), the government of France ($8.1 million), the government of Switzerland ($5.1 million), the German development bank KfW ($12.4 million), and an NGO of the borrowing country ($11.1 million). According to the Implementation Completion and Results Report (ICR) Review (World Bank 2016a), the borrower was expected to contribute $29.2 million. The actual amount of financing of the EP3 is unclear. The ICR reports only that IDA allocated $82 million and the Global Environment Facility allocated $19.0 million, respectively (World Bank 2016b, annex 1). The total actual IDA funding consists of the appraisal estimate of $40 million and an AF of $42 million. There is no discussion of the actual amount disbursed by other donors or the borrower.[8]

1.14 The EP3 went into effect in 2004 and ended in 2015, six years after the initial closing date. NEAP was implemented between 1990 and 2015 with the first and second phases of the EP implemented between 1990 and 1995 and 1996 and 2000, respectively. As the last phase of the programmatic series, the EP3 was initially designed as a five-year project and the original closing date was 2009. However, the project was restructured 10 times (including three major restructurings discussed in the next two paragraphs), and the timeline of the EP3 was extended multiple times. The EP3 was eventually closed in December 2015.

1.15 The design of EP3 was intermittently simplified to focus mainly on biodiversity conservation with the intention to address the design issues and the risks posed to project completion due to the 2009 political coup. The EP3 design was first simplified after the Mid-Term Review in 2008 to reduce the ambition of project activities (especially under the first component) and to directly fund and oversee safeguard compliance. The second major restructuring followed a political coup in 2009, when the World Bank applied the Operational Policy / Bank Procedure (OP/BP) 7.30, Dealing with De Facto Governments, and temporarily put disbursements on hold for all projects.[9] The World Bank Board granted the EP3 an exception to the OP/BP 7.30 regulation on the grounds that suspension of its project activities would effectively terminate environmental protection for approximately one-third of Madagascar's PAs. As the reputational risk was assessed too high, the implementation of an Environmental and Social Safeguards Action Plan was authorized. The action plan focused on two core activities: (i) the conservation of 1.6 million hectares of PAs by supporting environmental surveillance and protection activities in all 29 PAs; and (ii) the implementation of compensation schemes for 26,000 households living in and around the 11 PAs that were created or extended by the EP3.[10] The project thus continued to support a limited number of activities linked to PA management and dropped the other three project components. The project timeline was also extended to June 2011.

1.16 The political instability continued beyond 2011, when the project received AF (the third major restructuring) to avoid having critical PAs lose environmental protection and to support project-affected people whose livelihoods were affected by the creation of new PAs. The AF was justified for reasons like the exemption of the OP/BP 7.30 regulation in 2009. First, the closure of the project would lead to the immediate termination of conservation support for 1.9 million hectares of PAs. Second, without support from the Environmental and Social Safeguards Action Plan, 26,000 households would lose access to project activities to mitigate the socioeconomic effects of biodiversity conservation (World Bank 2011). The AF significantly simplified the original set of PDOs to a single PDO—namely, to enhance the protection and sustainable management of selected PAs. The AF approved in October 2011 extended the EP3 by three years, but the project eventually closed in December 2015.

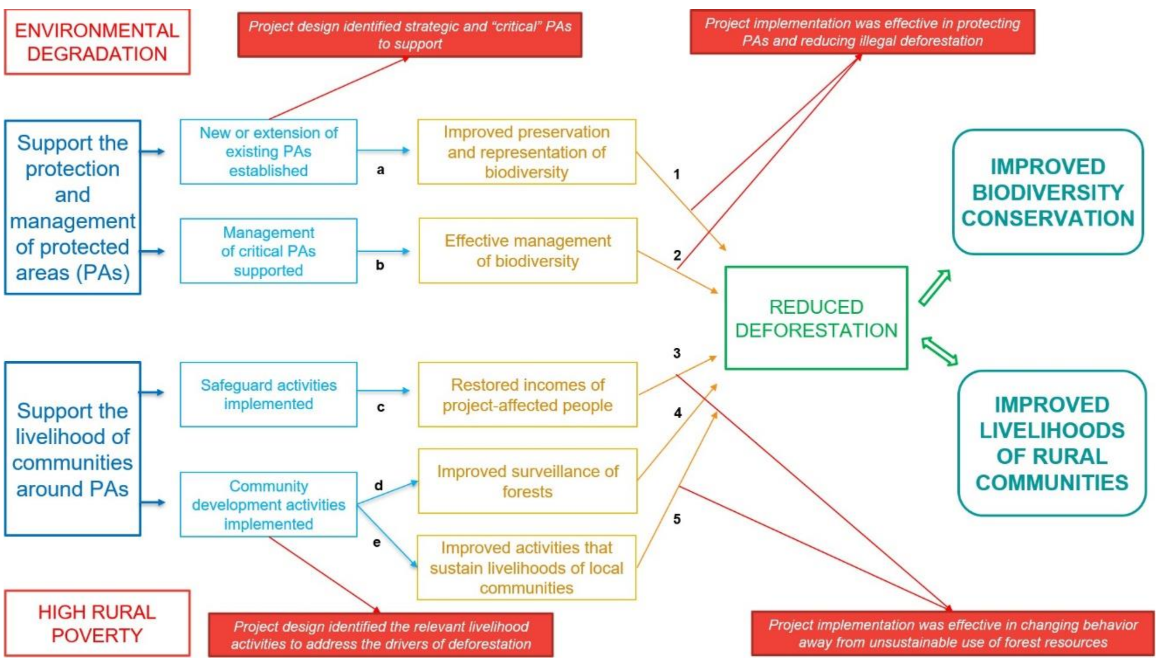
1.17 The project activities were revised accordingly during the AF to focus project support on (selected) PA management and local community development. The project components approved during the AF were Protected Area and Landscape Management, Local Community Support and Development, and Sustainable Financing Mechanisms for Protected Areas, and Project Management, Implementation, Monitoring, and Evaluation. In addition to the 29 PAs already covered by the original design, the first component supported 4 other PAs: one national park and three forestry corridors. The latter, part of the new PAs proposed by the Durban Vision, were the Fandriana–Vondrozo (COFAV), Ankeniheny–Zahamena (CAZ), and Makira forest corridors. The second project component directly implemented both safeguard and nonsafeguard (for example, forest surveillance) activities. Safeguard activities differ from other approaches because safeguards systematically target project-affected people and are not implemented at the village or community level (World Bank 2013). These CDAs targeted 90,000 households and required a budget of $15 million. The third component supported the financial sustainability of the PA network mainly through the endowment of a biodiversity fund and support for ecotourism development. Appendix A provides a more detailed discussion of the AF project components.

2. What Worked, What Didn't Work, and Why?

2.1 This evaluation focuses on the overall effectiveness of EP3's simplified and revised objectives and outcomes regarding improved biodiversity conservation and livelihoods and the factors explaining project achievement. This assessment constructed a theory of change (ToC) for EP3 based on both the initial project design (see figure D.1 in appendix D) as well as the restructured AF design. The evaluation focuses on the latter since the complete ToC is too complex and detailed to be subjected to a rigorous assessment. As discussed in section 1 under Financing and Project Restructuring, the EP3 could not implement several project activities for multiple reasons. The simplified version of the ToC constructed by the Independent Evaluation Group (IEG) captures the main activities implemented by the project. The simplified ToC in figure 2.1 identifies the pathways (outputs at left in blue, short-term outcomes in the center in beige, and long-term objectives at right in green) through which two types of project support activities affected the project's higher-level objectives. For simplicity, only direct and linear connections among elements of the ToC are visualized, but in reality, more complex and indirect interactions likely affected the higher-level outcomes of improved biodiversity conservation and improved livelihoods. As shown in figure 2.1, IEG puts reduced deforestation (rates) as the central project objective and the most important pathway for biodiversity conservation in the forest habitats of Madagascar. At the same time, as the livelihoods of local communities are dependent on forest resources, the project expected more sustainable and rewarding resource management to simultaneously reduce deforestation and improve the livelihoods of rural people living in poverty.

2.2 The PPAR assesses the project's assumptions and effectiveness regarding improved biodiversity conservation and livelihoods. In particular, the PPAR focuses on EP3's support for the establishment or extension of PAs to reduce deforestation. It tests the project assumptions that the critical PAs identified and supported by the project can reduce deforestation. The PPAR also assesses how the EP3 supported communities through CDAs. The ToC assumes that the project design identified eligible project-affected people and relevant livelihood activities, and that project implementation was effective in changing unsustainable human behavior. Given these assumptions, the EP3 was expected to improve livelihoods, resulting in lower deforestation rates, and vice versa. Thus, as figure 2.1**Error! Reference source not found.** illustrates, the PPAR discusses the most important (but a subset of) pathways through which the revised project activities affected the higher-level objectives of improved biodiversity conservation and livelihoods.

Figure 2.1. The Simplified Theory of Change of the Third Environment Program Support Project



Source: Independent Evaluation Group.

2.3 The methodology of the PPAR relies on geospatial data complemented by insights from household-level data and interviews with key stakeholders. The second paragraph under Deforestation Rates briefly explains the methodology of the PPAR, and appendix C provides a detailed discussion. The primary data source is the geospatial data on the environment in Madagascar that are freely accessible from different global data sets. The geospatial data allow us to measure project effectiveness and identify the (heterogeneous) effect of project support. The data, however, do not allow us to understand the daily realities of households living in and around the forest frontiers. To address such issues, the PPAR analyzes secondary information from households in several villages surrounding forest corridor Ankeniheny–Zahamena, one of the new PAs (see figure D.7 in appendix D). Insights from the household-level data collected for farmers surrounding the CAZ are used to substantiate some of the PPAR findings. The PPAR further draws on the extensive literature on the environmental sector in Madagascar. Finally, the PPAR interviewed key stakeholders to obtain qualitative insights to interpret the quantitative findings. Due to travel restrictions imposed by the COVID-19 pandemic, all interviews were conducted by video conferencing with the respondents. A formal evaluation mission (online) was not organized.

Results

Protected Area Coverage

2.4 EP3 increased the coverage, and helped expand the number, of PAs in Madagascar. In 2005, the SAPM consisted of 46 PAs covering 1.7 million hectares of land. At the end of the EP3 in 2015, encouraged by the objectives of the Durban Vision, the SAPM included 122 PAs covering over 7 million hectares.[11] This is almost a threefold increase in the number of PAs and a fourfold increase in the area of coverage. The EP3 directly supported the management of 33 PAs covering 2.7 million hectares of land and supported the expansion of 860,000 hectares of land under PAs (through newly established or expanded PAs). The share of PAs who's management was supported by EP3 is represents 60 percent of the parks managed by MNP and over a third of the land covered with PAs. Moreover, out of the total expansion of 860,000 hectares, the EP3 supported the creation of 0.5 million hectares of multiaccess forest corridors (representing 15 percent of the new PAs) where a flexible management model was implemented by NGOs. Without EP3 support, Madagascar would not have been able to expand and manage the SAPM.[12]

2.5 Through the protection of vulnerable PAs during an implementation period marked by several political conflicts and instabilities, the EP3 contributed to natural resources protection in a fragile setting. Besides protecting forests, the EP3 also ensured that donors, environmental NGOs, and other stakeholders in the environmental sector would collaborate under a single framework. This is remarkable given the occurrence of the political coup and other political instabilities (see the discussion on institutional efficiency in section 3 of appendix A), which can have detrimental impacts on the effectiveness of a project.

2.6 Although the EP3 was important to achieving the objectives of the Durban Vision, the management of the dramatically expanded PA network was unsustainable because the right institutional capacity and the financial resources were not in place. At EP3's appraisal, it was evident that weak institutional capacity and financial resources to manage the SAPM compromised the effectiveness of the EP1 and EP2. During the project's timeline, the annual revenues generated by MNP were largely insufficient to cover the annual management cost of the MNP-managed PAs and the need for compensatory payments to communities within new PAs (appendix A elaborates on the financial sustainability in more detail). The establishment of the biodiversity fund was expected to alleviate financial resource constraints, but to date, the revenues generated through the fund are insufficient to bridge the funding gap. Therefore, the SAPM has remained highly dependent on external support to fund the recurring operational costs. Finally, there is no evidence that the capacity to manage the SAPM at field (PA) and institutional level improved over the project timeline. The quality of PA management—measured by management effectiveness—increased early in the project, but progress was not monitored throughout the project.

Deforestation Rates

2.7 The project reported deforestation rates close to the project target, but these reported results are not useful for understanding project effectiveness because of the lack of a proper counterfactual and baseline value. For ease of reference, we refer to PAs supported by the EP3 as project PAs and those that did not receive support as nonproject PAs. The ICR of the EP3 reports average annual deforestation rates of 0.53 percent in project PAs by the end of the project. This value was 0.09 percentage points above the project target of 0.44 percent, meaning that deforestation rates were higher than expected. Although the reported deforestation rates are in line with deforestation rates for Madagascar as a whole (Vieilledent et al. 2018), these reported results are not useful for understanding project effectiveness. First, the ICR analysis did not identify a proper counterfactual of project support. There is no information on how the deforestation rates of project PAs would have fared if these PAs did not receive support from the EP3 (but potentially from alternative support models). Second, a more precise measurement of effectiveness is the change in deforestation rates, rather than the rate of deforestation at a given point in time. Looking at changes over time is important to account for preprogram differences. Third, project PAs and nonproject PAs are likely to be different in climatological and management (IUCN classification) characteristics and are likely to have different climatological and management (IUCN classification) characteristics and socioeconomic pressures. The analysis needs to control for these confounding factors. Moreover, an average value of deforestation rates for all PAs is likely to mask heterogeneity in project effectiveness.

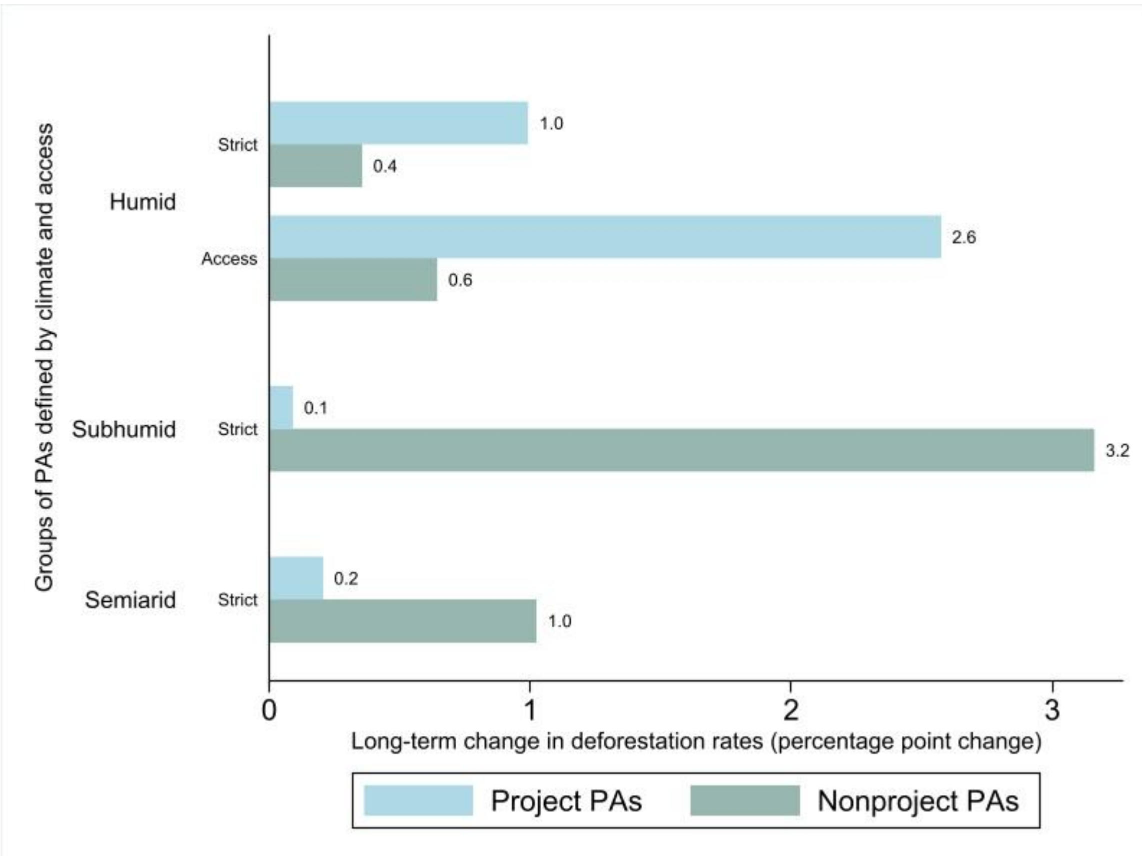
2.8 Therefore, IEG performed an independent assessment of geospatial data available on forest cover and the drivers of deforestation in Madagascar. To address the above shortcomings in the ICR methodology, IEG first measures deforestation rates using granular and more recent geospatial forest-cover data in Madagascar. Then, the PPAR assesses the effectiveness of the EP3 by estimating a statistical difference-in-difference. This means that we compare the average value of deforestation rates (i) before and after the project and (ii) with and without the project. The first comparison captures the change in deforestation rates over time, where a negative value would indicate that deforestation rates (in percentages) have decreased over time (as expected by the project). The second comparison captures how this change in deforestation rates is different between project and nonproject PAs. A negative value of one would mean that EP3 support has reduced deforestation rates in project PAs by one percentage point over the change measured in nonproject PAs. The group of nonproject PAs includes PAs which are highly similar to project PAs regarding the basic (management) characteristics of PAs.[13] The difference-in-difference comparison is not only a robust estimation of project effectiveness, it also looks at a longer time period (2000–15) and controls for confounding factors that might affect deforestation rates. However, although it is a methodological improvement, the difference-in-difference is not free of measurement error and endogeneity issues, and an ideal counterfactual comparison remains difficult because EP3 support has been substantial (rather than at the margin).

2.9 The increased placement of forest habitat under PAs in the EP3 did not result in the envisioned reduction of deforestation rates. The difference in the change in deforestation rates (before and after the project) between project PAs and nonproject PAs is not statistically significant. The difference-in-difference comparison shows that the change in deforestation rates over the project period is positive for both project (an average increase of 1.41 percentage points) and nonproject PAs (an average increase of 0.83 percentage points). Deforestation rates have also increased, not *decreased*, over time and for both groups of PAs. But, more importantly, the average change in deforestation rates is statistically not significantly different between project PAs and nonproject PAs. Thus, the EP3 support has not been able to curb deforestation rates more effectively compared to other support models to PAs. This finding does not mean that terrestrial PAs are ineffective in reducing deforestation rates compared with unprotected forest habitats. However, the finding that annual deforestation rates of both project and nonproject PAs increased over time contributes to the scientific evidence of marginal effectiveness of PAs in reducing deforestation rates in Madagascar (Desbureaux et al. 2015; Desbureaux and Damania 2018; Eklund et al. 2019; Waeber et al. 2016).

2.10 The effectiveness of EP3 support to reduce deforestation rates in targeted PAs shows considerable heterogeneity. IEG performed a subgroup analysis based on groups of climate zones (humid, subhumid, and semiarid) and access type of PAs (strict or multiple use based on the IUCN protection classification). IEG's analysis was further focused on a representative subgroup of terrestrial PAs (see appendix C). Figure 2.2 presents the long-term change in deforestation rates for the different climate-access groups, where positive values indicate increases in deforestation rates over time. The average values are differentiated for project PAs (blue or top bar) and nonproject PAs (green or bottom bar) in each climate-access group. In the humid zones of eastern Madagascar, the (average) change in deforestation rates is statistically significantly higher—between two and five times—in project PAs compared with nonproject PAs.

This holds for both types of access PAs. By contrast, in the subhumid and semiarid climate zone, the long-term changes in deforestation rates are significantly lower for project PAs than nonproject PAs (all with restricted access). However, as the majority of project PAs are located in the humid climate zone (57 percent; see table 2.1 in the Design and Preparation section), figure 2.2 illustrates the overall limited success of the EP3 in reducing deforestation rates.

Figure 2.2. Long-Term Change in Deforestation Rates Using Comparisons between Protected Areas Supported by the World Bank and Those Not Supported by the World Bank



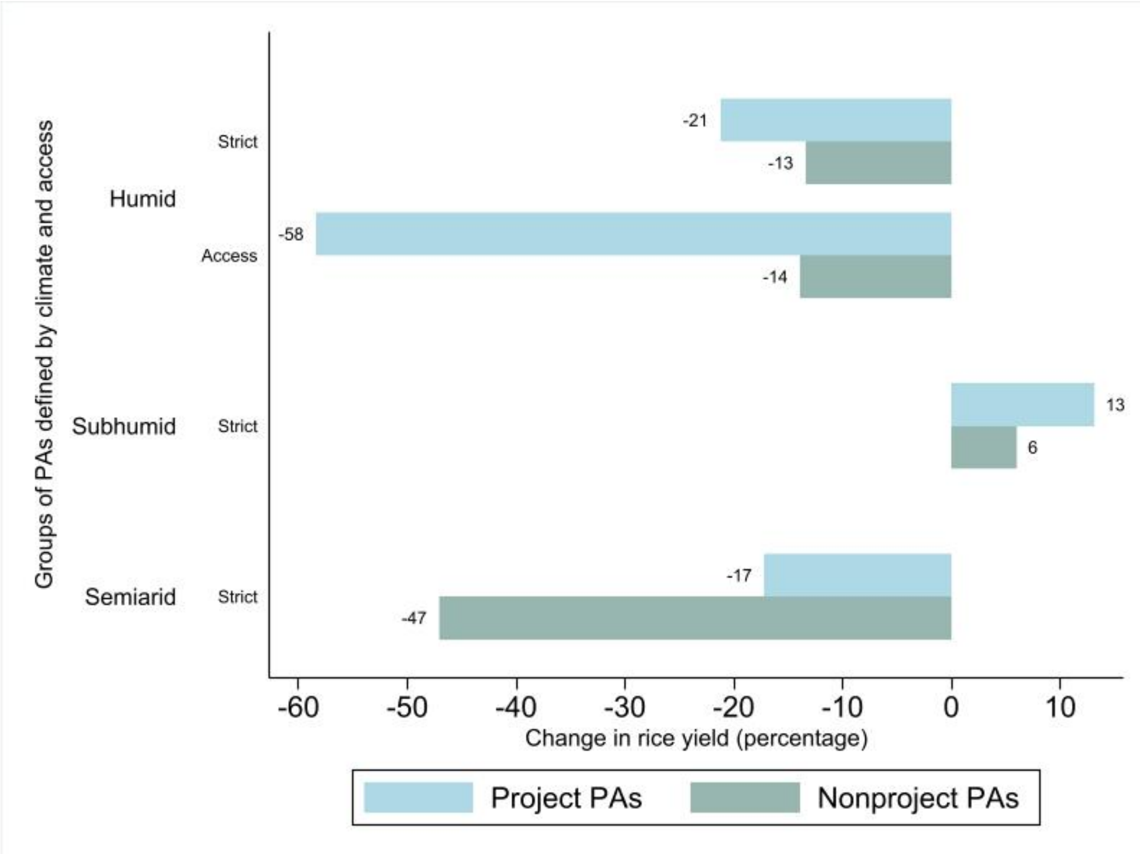
Source: Forest-cover data from Vieilledent et al. 2018.
Note: See appendix C for an explanation of the data. The long-term change in deforestation rates (measured in percentage point change) is the difference in annual deforestation rates after (2015–17) and before the implementation of the Third Environment Program Support Project (2000–05). On the y-axis, humid, subhumid, and semiarid refer to the different climate zones in which the PAs are located. Within climate zones, strict and access refer to strictly controlled and multiple-use PAs. PA = protected area.

Household Livelihoods and Human Behavior

2.11 Both project PAs and nonproject PAs are under immense pressure from declining agricultural productivity levels for staple crops, reduced fallow periods, and growing populations. The agricultural sector links the two higher-level NEAP objectives. Farming is both the most important livelihood activity and the most important driver of deforestation (Freudenberger 2010; World Bank 2015a).[14] The low fertility of soils encourages the use of shifting or swidden cultivation for subsistence crops, which is often associated with slash-and-burn agriculture and locally called *tavy* or *tevy-ala*.[15] In this process, forested soils are cleared for agricultural purposes. For example, farmers themselves (25 percent) or their parents (50 percent) cleared forests to create agricultural plots in the areas surrounding the CAZ corridor (numbers based on the household data from Poudyal, Jones, et al. [2018]; see appendix C). Moreover, the length of fallow on these plots has dropped from eight years historically to five years currently. Finally, IEG analyzed the agricultural production estimates on the land around the PAs considered in the PPAR. Table C.4 in appendix C shows that, between 2000 and 2010, the rice yield (staple crop) around PAs decreased by 19 percent while the yield of maize (cash crop) has significantly increased by almost 90 percent.

2.12 Failure to address the decline in agricultural productivity over time around PAs is one of the possible explanatory factors for the observed trend in deforestation rates. IEG found no evidence that heterogeneity in project effectiveness is related to climatological and basic characteristics of the PAs or differential support provided by the project (see the section Heterogeneity in the Project Effectiveness section in appendix C). Rather, the differential effectiveness is related to the underlying drivers of deforestation, and how the project addressed these factors. Figure 2.3 compares the change in rice yields between 2000 and 2010 on the lands outside the border of PAs for different climate-access groups.[16] This comparison needs to be interpreted with caution, however, because the yield data do not capture the later years of the project, yield changes can be ambiguously related to land pressure, and association is not causation. Nonetheless, figure 2.3 shows similar subgroup patterns as observed in figure 2.2 but in the *opposite* direction. The humid climate zone of Madagascar, which is the main agricultural zone because of its abundance of rainfall for rainfed crop production, has seen the largest decrease of rice yield outside PAs over time. However, this decreased rice yield is much more pronounced in project PAs, and especially for multiple-use PAs. Thus, figure 2.3 provides no evidence that the EP3 succeeded in addressing the decline in agricultural yields around PAs.

Figure 2.3. Change in Rice Yield between 2000 and 2010 on Land Surrounding Protected Areas



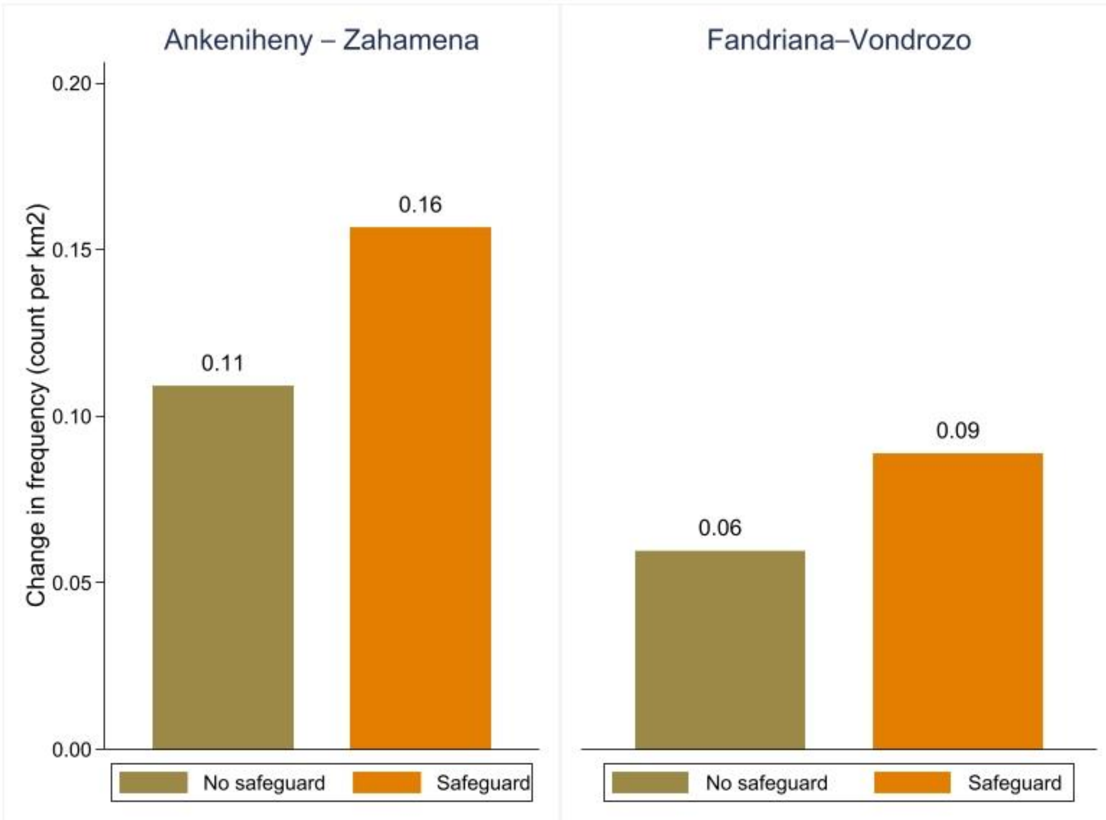
Source: Rice production data come from the Spatial Production Allocation Model (You et al. 2014).
Note: See appendix C for an explanation of the data. The change in rice yield is the difference between rice yields (kg per hectare) before the project (2000) and during the project (2010). On the y-axis, humid, subhumid, and semiarid refer to the different climate zones in which the PAs are located. Within climate zones, strict and access refer to strictly controlled and multiple-use PAs. PA = protected area.

2.13 Local communities surrounding PAs did not see agricultural incomes improve or livelihoods restored as a result of project support. The EP3 supported the agricultural production and livelihoods of local communities through different World Bank environmental and social safeguard and nonsafeguard CDAs. The ICR, however, lacks evidence about whether and how CDAs improved beneficiaries' livelihoods. It does report that CDAs reached less than half of the intended project-affected people and that most of the project-affected people expressed dissatisfaction with the compensation activities through project surveys.[17] To better understand the effect of CDA-related safeguard implementation, IEG analyzed the secondary household-level data collected by Poudyal, Jones, et al. (2018) in two sites around the CAZ, where one site received safeguard activities and the other did not. The income of households located in these two villages is compared, controlling for the effect of farm size, household size, and human capital of farmers (the methodology is explained in the section Household-Level

Data of appendix C). Although comparing these two sites remains descriptive (there is, for example, no baseline), the results (reported in figure D.7 in appendix D) suggest that although households in the safeguard sites had more access to an irrigated rice field, their agricultural (and total) income was not significantly different from households located in sites without CDA-related safeguard activities. This finding is discussed in more detail in the section Implementation and Supervision.

2.14 The lack of improvement in households' livelihood resulted in a continuation of unsustainable human behavior within and around the PAs. Tavy is often associated with either the clearance of small patches of forest for agricultural purposes or the burning down of shrub on already cleared lands. The latter exposes the surrounding forest to often uncontrolled fires. IEG analyzed how the implementation of the safeguards for two large forest corridors (COFAV and CAZ) affected the occurrence of forest fires. IEG combined the information on safeguard implementation available in the environmental assessment prepared for each corridor with the change in the frequency of forest fires (occurrence) between 2001 and 2015. Both sets of data are available at the Fokontany level, which corresponds to the lowest level of government in Madagascar, similar to a village or set of villages.[18] If the project was successful in promoting agricultural practices more sustainable than tavy, the frequency of forest fires is expected to decrease over the project timeline. However, figure 2.4 shows that the group of Fokontany receiving safeguard support (orange bar, to the right in each set) saw a larger increase in the frequency of forest fires compared with Fokontany not receiving safeguards (brown bar to the left in each set). This subgroup difference should be interpreted with care because—except for the size of the Fokontany—the analysis does not control for confounding factors or existing village differences.[19] Even though a simple subgroup comparison cannot capture all nuances and granularities of safeguard implementation, the results do not suggest that safeguard implementation reduced human pressure on forests.[20]

Figure 2.4. Change in Frequency of Forest Fires in a Fokontany with and without EP3 Safeguard Implementation in Two Forest Corridors.



Source: Forest fire data come from the Fire Information for Resource Management System of Moderate Resolution Imaging Spectroradiometer (2020).
Note: See appendix C for an explanation of the data. The change in forest fire frequency is the difference in forest fire frequency measured in 2015 and 2001. The frequency of forest fires in each year is the count of forest fires per pixel aggregated at the level of the Fokontany to which the pixels belong. The two bars refer to the change in fire frequencies for Fokontany that received safeguard support (safeguard in orange at right in each set) and that did not receive safeguard support (no safeguards in ocher at left in each set). This comparison is made for Fokontany in the Ankeniheny–Zahamena (left) and Fandriana–Vondrozo (right) corridor. EP3 = Third Environment Program Support Project.

Design and Preparation

2.15 The initial design of the EP3 was complex and overly ambitious despite the lessons provided from earlier phases that such design issues can compromise project implementation. The ICR of EP3 rightfully identified the following design flaws: complex objectives and overambitious targets of the EP3, the broad range and geographic dispersion of activities, the lack of coordination between stakeholders, and internal institutional, governance, and managerial weaknesses (World Bank 2016b, para. 39). Although the project restructurings after the Mid-Term Review and AF aimed to simplify project objectives and activities, the ICR makes a fair judgment that the AF was overambitious because of an "extremely ambitious scope of the project" (World Bank 2016b, para. 48). Similarly, the design of the M&E system remained poor, with a lack of indicators to track long-term project impacts (World Bank 2013), even though the Mid-Term Review and AF substantially revised the M&E system. Unfortunately, these issues were not new or unique to EP3. IEG's evaluation of the EP2 already identified that a complex and overly ambitious design, together with unrealistic objectives and a poorly designed M&E system, could undermine a project's credibility and implementation (World Bank 2004c).[21] Thus, even though valuable lessons were learned and the World Bank team effectively *attempted* to simplify its approach, the EP3 suffered from similar complexity and ambition design issues as its precursor projects.

2.16 By simplifying and focusing the project on field-level conservation in response to the political coup, the EP3 undermined its ability to achieve the needed institutional capacity building and policy mainstreaming. The first and second EPs created and strengthened several new environmental agencies. However, both governmental and parastatal institutes require continuous institutional and governance capacity building (World Bank 2004c; World Bank 2013; World Bank 2016b). The original design of the EP3, therefore, built the institutional capacity of central PA management and the environmental and forestry administration. However, after the political coup, the project's support was increasingly steered toward the field-level management of targeted PAs. Moreover, the OP/BP 7.30 regulations, which were in place between March 2009 and December 2013, prohibited the support of central or local government agencies. Thus, the AF halted institutional capacity-building activities, which marked a departure from one of the primary objectives of the series of EPs to strengthen all the agencies involved in the NEAP.[22]

2.17 A narrow focus on biodiversity conservation at the field level requires strategic and informed decision-making about the type of PAs to support. A key assumption in the ToC of the EP3 (figure 2.1) is that the project identified strategic and critical PAs to support. The project PAs were a subset of PAs within the MNP network and their selection was based on 11 criteria agreed on during a reiterative and participatory prioritization process. The methodology and outcomes of this selection process are, however, poorly explained in the Project Appraisal Document or ICR.[23] To better understand whether the World Bank provided support for particular hot spots of deforestation, IEG compared the project PAs with nonproject PAs in terms of basic PA characteristics (including management), historical deforestation rates, and socioeconomic factors. Table 2.1 reports the results of this comparison using geospatial data collected before the EP3 was implemented.

Table 2.1. Comparison of Characteristics, Deforestation Rates, and Socioeconomic Factors in Project and Nonproject Protected Areas

Category	Project PAs (n = 23)	Nonproject PAs (n = 22)	Significant Difference
Basic PA characteristics			
Year status assigned (year)	1958	1961	-
PA area (km^2)	1,131	347	**
Strict IUCN category (percent)[a]	90	70	*
Humid climate (percent)[a]	57	59	-
PA is a national park (percent)[a]	65	23	***
Management by MNP (percent)[a]	83	59	*
Management by NGO (percent)[a]	13	23	-
Comanagement arrangement (percent)[a]	91	73	-
Support from EP1 (percent)[a]	17	14	-
Support from EP2 (percent)[a]	30	41	-
Biodiversity aspects			
Annual deforestation rate 2000–05 (percent)	0.2	0.2	
Tree coverage in 2000 (km^2)	895	256	**
Tree coverage in 2005 (km^2)	884	253	**
Count of critically endangered species (number)	10	7.8	***
Locational aspects			
Altitude (meters)	624	468	***
Annual precipitation (ml)	310	298	-
Slope (percent)	9.8	6.7	*
Travel time to nearest town of 50,000 (minutes)	676	468	**
Socioeconomic indicators			
Frequency of forest fires 2001 (percent)	0.03	0.04	-
Frequency of forest fires 2005 (percent)	0.1	0.2	-
Population density (people per km^2)	0.2	0.2	-
Rice yield estimation (kg/ha)	1,553	1,559	-
Maize yield estimation (kg/ha)	609	626	-
Distance to closest mine (km)	104	154	*

Source: See table C.1 in appendix C for a detailed overview of data sources.
Note: Project PAs are PAs supported by the EP3, whereas nonproject PAs are PAs that did not receive support from the EP3. The variables and their measurement are explained in table C.1 of appendix C. The unit of each variable is indicated in parentheses. The average value for each group is reported in the columns. Significant difference refers to the test of whether the difference between the two groups is statistically significant; "no" means that the difference is insignificantly different from zero. AP = Aires Protégées; EP = Environment Program Support Project; MNP = Madagascar National Parks; NGO = nongovernmental organization; PA = protected area.
a. For these variables, "percent" refers to the percentage of PAs for which the dummy variable takes the value one.
Significance level: * = 10 percent, ** = 5 percent, *** = 1 percent, - = not significant.

2.18 The project PAs contained more forest and critical species and, thus, required protection from a purely biodiversity perspective. Project PAs are larger, fall under a stricter protection status, and are more likely to be national parks compared with nonproject PAs (table 2.1). Although the sample size is small, and hence any statistical comparison is underpowered, table 2.1 suggests no significant difference in the management arrangements nor support from the previous phases of the NEAP. Regarding biodiversity aspects, during the five years between the end of the EP2 and the implementation of EP3 (2000–2005), the annual deforestation rates of supported and nonproject PAs were similar in magnitude (on average 0.2 percent). Similarly, the deforestation rates during the earlier phases of the NEAP were also—on average—the same (not reported in table 2.1). However, the average coverage of land with trees within PAs was almost three times larger in project PAs compared with nonproject PAs. Similarly, the number of critically endangered species was significantly larger in project PAs. Thus, project PAs had more forest and critical species to protect, and, hence, a larger intrinsic value for biodiversity conservation.[24]

2.19 There is, however, no indication that the underlying drivers of biodiversity losses were systematically considered in the selection of project PAs. Figure D.2 in appendix D provides a selective literature review on the drivers of deforestation in Madagascar. In addition to the primary driver of slash-and-burn farming practices (see para. 2.11), human deforestation results from unsustainable firewood collection and charcoal production (driven by population density) and more recently from illegal logging and mining activities. In the past decade, and after the political instability from 2009 onward, illegal logging of precious hardwood for export and large-scale industrial mining has become an important driver of deforestation in forests outside PAs. In IEG's analysis, human-induced pressures on forests are proxied by the changes in forest fire frequency, agricultural yields, and population density measured on land outside PAs. Table 2.1Table 2.1 shows no significant differences between supported and nonproject PAs in terms of deforestation drivers linked to human behavior. For example, the levels of rice and maize yield on the land outside PAs were—on average—not significantly different between project and nonproject PAs. This finding suggests that addressing the root causes of deforestation did not drive the selection of PAs to protect under EP3.

2.20 There is a historical imbalance in the NEAP's attempt to reconcile conservation and development objectives. Box 2.1**Error! Reference source not found.** provides a description of the NEAP and its attempt to "reconcile man with his environment" (see paragraph 1.1). The NEAP primarily satisfied the desire of the international community to protect Madagascar's unique biodiversity. It raised national interest as a means for the government to attract foreign aid and private investments. Consequently, environmental conservationists designed and implemented the NEAP with a focus on biodiversity conservation. However, they had little understanding or appreciation of the socioeconomic realities and resource-use patterns of local communities (Corson 2012). This created a dilemma for integrated rural development: PAs were created as green islands of isolated forests designed to be kept free of humans. Hence, humans were initially considered a threat rather than a partner (Risby 2008).

2.21 The favoring of biodiversity conservation over livelihood development reduced the effectiveness of the NEAP at the field level. The Durban Vision and lobbying by international NGOs at the onset of the EP3 accelerated the project's narrow focus on biodiversity protection and PA coverage. Although the EP3, in contrast to its precursors, recognized the existence of negative impacts of PAs on local communities (Pollini 2011), it focused on implementing conservation activities while minimizing the negative socioeconomic impacts (World Bank 2004d).[25] But, by assigning the responsibility to implement livelihood activities to another rural development project of the World Bank, the EP3 eliminated human development activities from the project design. Thus, right at the onset of the project, the EP3 continued to favor the biodiversity conservation objective while the objective of livelihood improvements was considered an add-on. The borrower acknowledged this imbalance in its response to the ICR (World Bank 2016b, 36).[26] Evaluations of the EP1 and EP2 learned that this imbalance reduced the effectiveness of these projects (Pollini 2011).

Box 2.1. The Historical Imbalance between Biodiversity Conservation and Human Development in the NEAP

Conserving the biodiversity of Madagascar is of interest to the international community, the state and nonstate actors in Madagascar, and local communities surrounding the forests. The international community has long considered Madagascar a hot spot of biodiversity. Biologists, scientists, and environmental conservationists have shaped the global desire to conserve that unique biodiversity for the intrinsic biological and aesthetic value it brings and the global environmental benefits it generates. National interest in biodiversity conservation grew in the 1980s when Madagascar abandoned the socialist agenda and agreed to structural reforms that would introduce liberalization, privatization, and deregulation. At the same time, promoted by the growing importance of environmental NGOs, global recognition arose that biodiversity conservation and economic development could not be seen in isolation. International finance institutions—such as the World Bank and the International Monetary Fund—followed suit and envisioned that actions to combat environmental degradation needed to be integrated into the overall development plan of Madagascar. The NEAP resulted from the national recognition that environmental policies had to be incorporated into the broader macroeconomy to set the country on a path of sustainable development. The core objective of the NEAP was to reconcile the population with its environment to achieve sustainable development.

The NEAP aligned national and global interest in biodiversity conservation to primarily satisfy its donors: the international development and environmental community. The NEAP was a forward-looking program with ambitious targets. It served to align the interests of a diverse set of state and nonstate actors—including foreign aid donors, international NGOs, consultants, and private commercial interests—to integrate environmental policy making into the national development process. For NGOs, donors, and the World Bank, the NEAP became the model of their global environmental agenda. Madagascar was the first country in which a series of environmental support projects were funded by donors to implement the NEAP. The government of Madagascar understood that this global interest in biodiversity conservation would provide opportunities to attract international attention, foreign aid, and private investments. As such, the NEAP responded primarily to the global interests in Madagascar as a biodiversity hot spot, and environmental policy making focused on creating and managing PAs.[27]

However, little attempt was made to understand whether and how local communities were interested in reconciling with their environment. The design of the NEAP showed very little concern about how local communities living within and around forests were interested in conserving biodiversity or whether these communities even perceived a desire or need to conserve it. Communities had little or no voice and very limited influence on the government's decision-making. Moreover, the approach desired by local communities to conserve their resources might not necessarily align with the views of external actors. The global desire to conserve Madagascar's forests was thus misaligned with the realities, expectations, and aspirations of the local communities who would have to carry the burden of conservation efforts. The fundamental assumption of the alignment of interests between the international community and local communities is identified as a conceptual flaw in the NEAP approach.

The NEAP was designed and implemented by environmental conservationists with little understanding of the socioeconomic realities of local communities. Environmental policy making in the NEAP was most heavily influenced by NGOs and donors that promoted a narrow focus on biodiversity conservation. The EP1 had an important focus on managing and expanding the system of strict PAs to create isolated islands of forest. Decisions were made by conservation specialists (see para. 2.20). As such, biodiversity conservation was far removed from the rural landscape. The establishment of the SAPM in Madagascar introduced new forms of more decentralized and multiple-use PAs. It was a significant attempt to move away from conservative approaches to biodiversity conservation. However, the boundaries, rights, and authorities associated with these new PAs were shaped by nonstate actors with limited consultation of local communities and their socioeconomic context. The considerable amount of information available about forest biodiversity guided decision-making, but very little was known (or collected) on how local communities were using the forest resources to support their livelihoods.

The NEAP considered humans as a threat rather than a partner. Moreover, while new PAs would in theory have different zones allowing sustainable resource extraction by local communities, resource uses were limited to subsistence needs. Commercial extraction was not allowed as it was foreseen as unmanageable. While this provoked heated debates among the different stakeholders, a more restrictive conservation approach of new PAs was adopted, as preferred by major donors.

The continued dominance of conservation over development objectives resulted in limited improvements in human development throughout the different phases of the NEAP. Box 1.1 elaborates on the reasons why activities to support human development in the EP1 and EP2 failed. In short, development activities (i) were add-ons to convince local communities to participate in conservation, (ii) were poorly targeted toward privileged people, (iii) were poorly enforced, and (iv) did not include alternative livelihood activities for restricted access. The EP3 recognized the existence of negative impacts of PAs on local communities but removed livelihood support from the program (see para. 2.21). It did support the national regulatory framework for the assessment of environmental and social impacts (the Mise en Compatibilité des Investissements avec l'Environnement decree) that required the development and implementation of a social and environmental safeguards plan in new or extended PAs. However, as safeguards focus on mitigating or compensating for short-term negative effects, local communities were never truly compensated for the long-term consequences of restricted access to the forest (resources) by sustainable improvements in agricultural practices or tourism development (see box 2.2).

Sources: Based on findings from Corson 2012, 2020; Hanson 2012; Kull 2004; Pollini 2011; and Risby 2008.
Note: EP = Environment Program Support Project; NEAP = National Environmental Action Program; NGO = nongovernmental organization; PA = protected area; SAPM = System of Protected Areas of Madagascar.

2.22 The disappointing outcomes of a conservation approach centered around protecting terrestrial PAs, and the current shift toward protecting marine habitats, pose a significant risk to achieving the NEAP development outcomes in and around forest frontiers. Many natural forests in Madagascar are nearing their ecological tipping point, while the outside pressures from the impoverished local communities are mounting (Freudenberger 2010). However, donors (including the World Bank) are retargeting support from forest habitats toward marine habitats where species are more likely to recover when protected within large and relatively less conflictual areas in open sea (Mongabay 2017). This shift in donor preferences might illustrate the realization that terrestrial PAs and forest frontiers remain the hot spots of biodiversity losses but cannot be "saved" from human threats.

Implementation and Supervision

2.23 The lack of coordination between the EP3 and the World Bank's rural development projects resulted in none of the CDA projects being implemented. The decision to rely on accompanying rural development projects to implement CDAs might have been a sound decision at appraisal, given the limited financial resources and lessons from earlier phases of the EP. However, the expected synergies from streamlining environmental and rural development programs would require perfect coordination between the actors involved in the NEAP and the PSDR. It would also require a geographical overlap in the implementation of project activities and targeting of project beneficiaries. However, the NEAP and PSDR did not install proper coordination mechanisms (Pollini 2011; Razafindralambo and Gaylord 2008; World Bank 2016b).[28] Although the project implementation agencies of the EP3 and PSDR signed a memorandum of understanding, none of the PSDR funds were earmarked to support communities around PAs. Moreover, the government of Madagascar used a large share of the PSDR funds to finance recovery operations in response to a major rice crisis and the cyclone Gafilo in 2015. The ICR, therefore, concludes that the PSDR did not implement safeguard activities in communities surrounding PAs because of "conflicting project implementation schedules, interventions, and programming" between the different projects (World Bank 2016b, para. 67).

2.24 The AF introduced safeguard and nonsafeguard activities in the project to support the livelihoods of local communities. With no funds allocated in the original design to livelihood support, an AF was used to restructure the project and include livelihood activities.[29] The AF focused mainly on safeguard activities and, to a lesser extent, on capacity building of local communities to manage natural resources.[30] Of particular interest are the new PAs created or extended by the EP3. Here, the project team directly prepared and implemented the safeguard CDAs. These activities focused on promoting either improved methods for staple food production or alternative small-scale livestock activities (mostly beekeeping and chicken farming).

2.25 Safeguard support did not improve farmer livelihoods or result in sustainable management of forest resources. The comparison of the group of Fokontany that received safeguard support and the group that did not receive support (in paras. 2.13 and 2.14) shows no significant difference in agricultural incomes and frequencies of forest fires. The inability to change livelihoods and induce behavioral change away from unsustainable resource management provides the sobering conclusion that the EP3 did not contribute to the NEAP objectives to improve livelihoods. In the following paragraphs, we discuss potential reasons related to the implementation and choice of safeguards as the instrument to improve livelihoods. Box 2.2 discusses the academic research analyzing the challenges with the implementation of the social safeguards in one of these corridors, the CAZ.

2.26 The implementation of safeguard and nonsafeguard CDAs was a significant challenge. In June 2014, the implementation of subprojects related to CDAs (such as rice growing and chicken farming) was temporarily suspended. A supervision mission revealed $2 million of ineligible expenses, procurement anomalies, and potential fraud in service providers' contracts related to nonsafeguard subprojects supporting community development (see appendix B). The safeguard activities faced similar challenges. The procedures to identify eligible households for compensation—that is, those whose incomes were most affected by the restricted access to forests—did not work properly (Poudyal et al. 2016; box 2.2). **Error! Reference source not found.**Yet this is a critical assumption in the ToC in figure 2.1. Moreover, an audit of the implementation of safeguard plans further indicated that fewer than 8,000 out of the identified 23,000 project-affected people were fully compensated (World Bank 2016b). To finalize the implementation of the CDAs, a livelihood compensation sinking fund was created for the project-affected people and the project was extended to December 2015 (see appendix A). These implementation issues have been linked to the fact that environmental institutions are ill-suited to manage livelihood activities addressing the socioeconomic needs of the rural population (Erdmann 2010) and the expensive implementation by contractors (MacKinnon et al. 2018).

2.27 Social safeguards are inadequate instruments to introduce long-term changes in livelihood incomes. It is important to acknowledge that safeguard instruments are, by design, not the instruments to incentivize long-term improvements in the livelihoods of beneficiaries. Safeguard activities intend to restore the livelihoods lost by local communities because of their restricted access to natural resources. Households are expected to be compensated with ex ante calculated loss of income per person or family to achieve a zero net loss. At a minimum, projects need to achieve a "no net loss" so that communities are not worse off compared with the counterfactual of no project and no safeguard. The noneffect regarding income is, therefore, not necessarily surprising. However, as we will document below, the social safeguards were not effective in compensating households for restricted access to forest resources or in inducing positive behavioral change that would eventually lead to reduced deforestation.

2.28 Safeguard activities were unable to compensate forest-dependent communities for restricted access to forest resources that play an outsized role in providing food security and other sources of well-being. The creation or delineation of a PA implies that local communities are confronted with a long-term restriction to forest resources. The literature in Madagascar shows that these costs are high, unequally distributed, and annually recurring (Poudyal et al. 2016), while the benefits accrue in the short term and are likely captured by elites (Harvey et al. 2018; Poudyal, Rakotonarivo, et al. 2018). However, in most social safeguard plans of the NEAP, the opportunity costs are not accurately measured, even on paper, nor linked to the actual amount of compensation spent (Hockley, Andriamanankasinarihaja, and Rasoamanana 2020). The one-time compensation eligible households received from the safeguard activities in EP3 was largely insufficient to compensate these households for the loss in income from the long-term restricted access to forests (Poudyal, Rakotonarivo, et al. 2018; World Bank 2016b).[31] Local communities perceived the value of safeguard activities received equal to the *annual* opportunity cost of restricted forest access (Poudyal, Rakotonarivo, et al. 2018).

2.29 Social safeguards designed at the individual level are not the best tools to incentivize the sustainable management of forest resources by the entire community. Safeguard activities identify individuals whose livelihoods are affected by the creation of PAs and compensate individuals for that lost livelihood. The design of safeguards at the individual level was, however, not aligned with the cultural and social norms of local communities. The daily life of Malagasy people is built around the traditional natural unit the *fokonolona,* which refers to "the culture, history, and identity of the people and places where its popular economy flourishes" (Borrini-Feyerabend and Farvar 2011, 24). Because safeguard resources are limited, and targeting is expensive, not everyone in the village can be compensated. This can create social tension between poor households identified to be eligible for safeguard activities and their neighbors that might be relatively better off but still poor households. A generic approach to safeguards suggests that the safeguard activities included in the AF seemed a necessity to comply with the safeguard plan rather than an opportunity to introduce long-term improvements in people's livelihoods. According to Freudenberger (2010, 58), safeguards in Madagascar "ended up essentially 'buying off' people to not engage in tevy-ala by offering discrete and, in some cases, probably ephemeral benefit."

2.30 The time-limited and supply-side support for agricultural production will not address the root causes of the human pressures on forest resources. The safeguard activities provided simple, one-time, and supply-side support to improve the dominant agricultural activities of project-affected people. For example, the project provided improved rice seeds and technical support for one year to stimulate the transition from tavy to improved rice cultivation of project-affected people in the CAZ. However, these support activities did not address the fundamental problem of low soil fertility that forces farmers to tavy in the forest. On the contrary, farmers around the CAZ considered pests and soil fertility as primary constraints to higher rice productivity around the forest corridor (see figure D.7 in appendix D). Many farmers abandoned the new technologies after the safeguard activities ended, even if temporal improvements in productivity were observed (Freudenberger 2010). Moreover, farmers might lack the knowledge to transition toward alternative technologies, and tavy represents a sociocultural activity (Desbureaux et al. 2015; Desbureaux and Brimont 2015). The 2014 supervision mission confirmed that the CDAs were not tailored to the needs of local communities and documented low satisfaction by beneficiaries (World Bank 2016b, paragraph 128).

2.31 In sum, safeguard activities are unlikely to introduce structural changes in human behavior beyond the project's timeline, especially when not adapted to complex and traditional farm realities. For many rural Malagasy, the practice of tavy is important for their practical and cultural attachment to the land, as tavy is interlinked with claims to land rights (see para. 2.36), beliefs in supernatural spirits, and ancestor worship (Desbureaux and Brimont 2015; World Bank 2013). Due to the persistence of traditions, some households living in the forest frontier might not be willing to stop tavy in the short term despite being compensated for restricted forest access. Safeguard activities were, thus, not equipped to counter existing spiritual beliefs about unsustainable farming practice. There might also be a rebound effect, where deforestation rates increase after projects end because households want to compensate for the opportunity cost during the project (Desbureaux et al. 2015). In the long term, supply-side support does not provide the needed incentives for the transition toward more intensive, alternative, and sustainable agricultural production systems in the absence of markets. But projects that want to make a serious attempt to improve rural livelihoods beyond the project's timeline should go beyond the mere compensation of losses and make complementary investments to support longer-term improvements of livelihoods.

Box 2.2. Main Findings from the Academic Research on the Implementation of Social Safeguards in the Ankeniheny–Zahamena

As part of the Can Paying 4 Global Ecosystem Services Reduce Poverty? project (http://p4ges.org/), a research consortium of 11 institutions in five countries—headed by Bangor University—collected data on households living in the forest frontier of the Ankeniheny–Zahamena. A series of household surveys collected data to better understand the costs and benefits of conservation policies for the welfare of households that depend on forest resources for their livelihoods. The CAZ was created in 2015 through the EP3, and according to the World Bank's guidelines on social safeguards, 2,500 households (out of more than 60,000) were identified as project-affected people eligible to receive safeguard compensation. Safeguard activities were implemented starting from 2014 as livelihood subprojects focusing on improving food production, including beekeeping projects and small-scale livestock (mostly chicken farming). Below is a summary of the main findings from these data.

The safeguard procedures did not identify households whose incomes are the most vulnerable to restricted forest access as eligible households for compensation (Poudyal et al. 2016). The project worked with local institutions to identify households eligible for safeguard compensation in the villages. However, these institutions were not representative of the majority of households who heavily depend on forest resources for their livelihoods. Instead, households with a better socioeconomic status, better food security status, a membership in local forest management associations, and more access to markets were more likely to be identified as project-affected people. However, the members of local institutions are less likely to see their household incomes reduced from access restrictions. Thus, the use of nonrepresentative local institutions allowed local elites to influence decision-making, and social safeguards can hence exacerbate social inequalities instead of addressing them.

Less than half of the households that should have been eligible for compensation were identified by the World Bank methodology to receive safeguard compensation. Using the elicited value of the opportunity cost of restricted access, and households' income from agriculture, between 3,000 and 3,800 households were not identified as eligible for compensation. As a result, the process applied by the World Bank identified less than half of the appropriate number of project-affected people. The remoteness of local communities, the vast area covered by the CAZ, and the lack of detailed location information made it expensive and time-consuming to reach remote communities. In the communities that were visited, vulnerable households were reluctant to disclose unsustainable agricultural practices.

The opportunity costs of safeguard beneficiaries arising from the long-term restricted access to forests account for a substantial share of household income, and especially so for poorer households (Poudyal, Rakotonarivo, et al. 2018). A choice experiment elicited the opportunity cost households would experience when conservation measures restricted their long-term access to the forest for shifting agricultural cultivation. Over a household's lifetime, the median net present value of this opportunity cost was $2,375 but greatly varied among localities. The annual equivalent of the opportunity cost of restricted access was between $40 and $125 depending on the discount rate used. For a household mainly dependent on shifting cultivation, this opportunity cost accounted for 27–84 percent of total annual agricultural income and that share was significantly higher for poorer households across sites. Moreover, there are also cultural costs to abandoning *tavy*, which are more difficult to monetize (Desbureaux and Brimont 2015). Thus, restricted forest access has a significant and substantial impact on the socioeconomic well-being of poor households.

The planning of safeguards is not well documented, and it is difficult to understand whether safeguard plans have truly attempted to calculate the opportunity costs for which farmers need to be compensated, even on paper. A recent evaluation of the Environmental and Social Management Plans in Madagascar by Hockley, Andriamanankasinarihaja, and Rasoamanana (2020) shows that only 47 plans could be obtained from the 129 PAs. A review of 36 plans shows that 24 made a quantitative estimate of opportunity costs, but only 12 also published monetary amounts to be spent on safeguards. In none of these 12 plans was it possible to directly compare the amount identified and spent (for example, because of a lack of clarity about whether compensations are annual or a one-off) or to identify how the one informed the other.

The one-time safeguard compensation was largely insufficient to compensate for the loss of income from the long-term restriction (Poudyal, Rakotonarivo, et al. 2018). The World Bank safeguard policies stipulated that between $100 and $170 would be spent on each eligible household. This implies that safeguard activities, at best, compensate for the household's lost agricultural income for maximum of two to three years. However, households perceived the value of the benefits from safeguard projects at a lower net present value of $79. As such, the perceived value by households is only the value of an *annual* opportunity cost and accounted for less than 5 percent of the *long-term* loss in income. Based on this finding, Poudyal, Rakotonarivo, et al. (2018) conclude that none of the beneficiary households were fully compensated.

Note: CAZ = Ankeniheny–Zahamena forest corridor; EP3 = Third Environment Program Support Project; PA = protected area.

2.32 To reduce deforestation in forest frontiers, the establishment of more intensified agricultural production systems is necessary but needs to be complemented by opportunities to diversify household incomes. Over time, local communities will have decreasing access to the forest. Yet, because of the ever-growing population in Madagascar, more households will have to sustain their families on a smaller share of (new) fertile land and with fewer possibilities for tavy (Freudenberger 2010). Although short-term support for intensified agricultural practices is a first and necessary step to reduce the pressure on the forest and provide food security, it is not sufficient to reduce deforestation. It is a simplistic assumption that improvements in rice productivity would reduce tavy automatically (Jones, Rakotonarivo, and Razafimanahaka forthcoming). Without investment opportunities outside agriculture, cash from improved rice cultivation can be reinvested in cash crops, livestock production (especially zebu), or unsustainable nonagricultural activities that might put pressure again on the forest (locally but more likely elsewhere). Given the remoteness, localized land pressure, and limited market integration, the ability of the agricultural sector to improve the livelihoods of forest frontier dwellers sustainably remains limited. As such, households will have to be provided with the opportunities and the business environment to diversify away from unsustainable agricultural practices once their basic food security needs are met.

2.33 Ecoregional landscape approaches that integrate agricultural development with sustainable resource management offer a more comprehensive and territorial approach that integrates biodiversity conservation into land-use planning. A shift toward a more people-centric and integrated economy-led approach to biodiversity conservation is gaining traction in Madagascar, even at the political level (Mongabay 2020).[32] The ecoregional landscape approach currently supported by the World Bank in Madagascar focuses on watersheds providing water to irrigation schemes (World Bank 2017). The landscape approach (explained in box 1.1) is**Error! Reference source not found.** significantly different from the EP3 model where PAs were envisioned to drive ecoregional development. Local communities could potentially benefit from tourism and management activities related to biodiversity protection. Although there is global evidence (Sims and Alix-Garcia 2017) that incentive-based conservation approaches can achieve more balanced outcomes of conservation and livelihood improvements compared with strict PA systems, evidence is currently not available at project level (supported by the World Bank or others) in Madagascar.

2.34 Yet even such approaches to land-use planning as the ecoregional landscape approach fall short in capturing the full complexity of integrated natural resource management. The different land users identified in the agricultural landscape do not necessarily correspond with the main actors involved in deforestation. For example, poor and landless migrants are often hired by richer farmers from within the community to work as agricultural laborers and clear additional forested lands. In addition, migrants will also clear patches of forest for small-scale subsistence production. Often, these different actors are not sufficiently engaged or represented at political levels (Weatherley-Singh and Gupta 2017). Moreover, there is friction between the short-term need to compensate upstream users from reduced access to forest resources (for example, tavy or livestock grazing) and the long-term benefits downstream. Productive investments in irrigated rice fields and agroforestry also bear uncertain and heterogeneous profits. At the same time, the payment for ecosystem services should sufficiently compensate for the opportunity cost of the restricted access of upstream users (World Bank 2020). Finally, watersheds are typically so vast that the projects integrating these zones with important irrigated areas have only attempted or tinkered with small-scale pilot erosion projects with limited or no impacts.[33] As a result, the effectiveness of the ecoregional landscape approach is unclear when the fundamental underlying drivers of biodiversity degradation are not addressed.

2.35 Integrated rural development requires complementary investments that foster structural change. PAs and their surrounding communities are in remote parts of the country with limited transport and marketing infrastructure. The profitability of farm-level investments in the ecoregional landscape approach is uncertain without a properly developed marketing and transportation system to reward these investments. This requires structural investments along the entire value chain—for example, in transporting perishable products like vegetables. It also requires developing market demand (which is likely to be concentrated in more urban areas) and providing a price premium for reduced deforestation (through, for example, certification). There is potential for the sustainable development of agribusinesses and value-addition activities across the landscapes or near PAs (for example, vanilla, cloves, or cocoa). However, the private sector was virtually absent in the EP3. Private sector involvement, however, is complicated by an unfavorable business and political environment that does not provide the right incentive for individuals to seize opportunities and positively adjust their behavior. Hence, for any field-level intervention to be effective, a favorable higher-level policy framework needs to be developed (Freudenberger 2010).

2.36 As long as land tenure issues are not addressed, productive investments to intensify or relocate the cultivation of new agricultural land away from the forest frontiers will not be successful. The complexity of land tenure is a long-standing issue complicating the effectiveness of the NEAP (see box 1.1).[34] The state owns the forest, but weak enforcement and traditional regulations (*dina* bylaws together with social norms including *fady*) result in de facto open access to forests under customary ownership (box 1.1). However, once forests are cleared and converted into agricultural land, the individuals who clear the land acquire traditional usufructuary "ownership" rights over that land. As such, the practice of tavy allows farmers to claim customary forested lands and safeguard agricultural land for their future generations (Freudenberger 2010). Discrepancies between forest tenure rules (state ownership versus customary land) and weak enforcement provide households perverse incentives to clear the forest and exclude outsiders' access to tree fallow plots (Poudyal, Rakotonarivo, et al. 2018; World Bank 2013).[35] Yet land ownership remains informal and undocumented: Only 5 percent of the farmers living around the CAZ reported having formal tenure land rights for their agricultural plots. The situation is especially problematic in the new PAs.[36] Land tenure insecurity undermines the benefits of investments to improve land fertility. It further complicates projects that request farmers to abandon tavy and invest in their existing croplands. Evidence exists that private ownership of forest plots reduces the stated likelihood of deforestation compared with common ownership of forests (Rakotonarivo 2020).

2.37 Weak governance and regulatory issues erode the effectiveness of policies, such as land tenure, to provide the right incentives for more sustainable resource management. Corruption, the declining rule of law, and the virtual absence of regulatory and governance practices increasingly threaten the future of Madagascar's forests (Desbureaux et al. 2015; Jones et al. 2019). Repeated political crises, such as the recent coup from 2009 to 2014, lead to political instability and the pillage of natural resources including illegal logging of precious woods. Moreover, kleptocracy continuously undermines positive changes for resource management: Small elite groups—including businessmen, military, and politicians—rotate discriminatory redistribution and rent-seeking through development policies (Pellerin 2017; Vieilledent et al. 2020). This creates an established system of status quo and leaves behind most people in forest vicinities—that is, poorer farmers. Recent reports suggest those clearing the land are being paid, and protected, by local elites (Jones et al. 2019; Randriamampianina et al. 2020). The effectiveness of environmental or land policies will depend on improved local governance and strengthened regulatory processes that aim to control environmental crimes and punish those who orchestrate the demise of forests (Vieilledent et al. 2020).

3. Lessons

3.1 A narrow focus on the protection of biodiversity resources without addressing the underlying human pressures on these resources is unlikely to achieve the long-term goal of biodiversity conservation. The NEAP intended to achieve the joint objectives of biodiversity protection and the improvement of community livelihoods. The EP3 narrowly supported the protection of biodiversity resources by expanding the coverage and supporting the management of the PA system. This design reflected the important lesson from earlier phases of the EP that a single project cannot simultaneously achieve the joint NEAP objectives. Nonetheless, these earlier phases also showed that failing to consider the human pressures on biodiversity resources undermines the effectiveness of any field-level intervention to promote biodiversity protection. The analysis presented in the PPAR shows that EP3's support for biodiversity protection (illustrated by the selection of PAs supported) was driven by the intrinsic biodiversity value of PAs with little consideration of the interests and concerns of local communities. Because the EP3 activities did not directly support local communities, the root causes of biodiversity degradation within, around, and under forest habitats were not addressed. As a result, deforestation rates in project PAs were not different from other support models. Moreover, as local communities around PAs did not see their livelihoods improved, the conservation of biodiversity within PAs has not been an engine of sustainable economic development in Madagascar.

3.2 When PAs restrict the long-term access of rural households to forest resources indispensable for their livelihood, safeguard activities are insufficient and inappropriate instruments for promoting the sustainable use of forest resources in the long term. Time-limited and supply-side safeguard activities that compensate individuals for lost livelihood are not the best tools to incentivize the sustainable management of forest resources by the entire community, in remote locations, and in the longer term. Because of the remoteness of PAs, identifying eligible households is a notoriously difficult exercise that is expensive, time consuming, and susceptible to the influence of local elites. This creates social tension between eligible and ineligible households, which both heavily depend on forest resources for their food security and well-being. But even for those households targeted by the safeguard activities, the calculation of opportunity costs remains largely undocumented, and households perceive the value of compensation as often insufficient and safeguard activities as not adapted to the complex farm realities. Finally, safeguard activities are—by design—not the instruments to introduce long-term improvements in the livelihoods of recipients. A simple, one-time, and supply-side support for the dominant agricultural activities does not address the fundamental problem of low soil fertility that is a major contributor to deforestation in Madagascar.

3.3 Field-level interventions for biodiversity protection are unlikely to have long-lasting effects when the policy environment (norms, rules, and procedures) does not support the incentives needed to sustainably manage biodiversity resources. For poor people, the development nexus is not about conserving forests and giving up their livelihoods but about the value of and entitlement to their land. Therefore, the focus of development support should be on land-use planning and tenure security at a regional scale. However, the current political climate and socioeconomic conditions do not provide the different users of the land with the right incentives to sustainably manage natural resources. Rural landscapes are vast, have many different actors, and have inexistent or poorly developed land tenure systems, markets, and infrastructure. Moreover, continued corruption, political instability, and national kleptocracy create macropolitical instability and volatility that are not conducive to investing in new opportunities. Therefore, any support for long-term conservation of biodiversity in Madagascar is likely to be ineffective without simultaneous support for rural development—by addressing the issues of insecure land tenure, weak governance, and the absence of regulation—and support for a more stable and predictable macropolitical environment.

3.4 The objectives of a programmatic series to support higher-level development objectives around biodiversity conservation are undermined when the same design issues of overambition and complexity persist in each project. For many projects supporting long-term and higher-level objectives of biodiversity conservation, the short project timeline complicates the project's achievement—or measurement thereof—toward these higher-level objectives. Instead, a programmatic series, such as the EPs, intends to implement a series of projects that build on and learn from project experiences and to have a long-term commitment to higher-level development outcomes. However, all three EPs to implement the NEAP had to be scaled down during implementation because of the complex and overly ambitious design with unrealistic objectives in combination with a challenging political environment. In each EP, such design issues, combined with a poor M&E system that lacked indicators to track long-term project impact, reoccurred and undermined the credibility and field-level impacts of a biodiversity project with long-term objectives. Thus, although projects within a programmatic series are expected to build on the lessons learned from the previous phases, little of these experiences had been internalized in the design of the EP3.

Notes

[1] The diversity of the protected area (PA) system in Madagascar refers to the level of representativeness of habitats and ecosystems in the PA system.

[2] The PA system was extended to include (i) multiple-use management models that allow sustainable extractive natural resource uses following a zoning plan, (ii) shared governance arrangements involving nongovernmental organizations (NGOs) and local community associations, and (iii) an increasing emphasis on social and development objectives through livelihood-based approaches and social safeguards (Gardner et al. 2018). This shift was mainly a result of the fact that the remaining natural forest was largely surrounded by rural communities whose livelihood depends on forest resources, and a result of the lack of capacity of the Madagascar National Parks (MNP) to oversee the extension of the PA system (Ferguson et al. 2014). However, it remains an open question how different the new PAs are in terms of access to forest resources (because of the extensive core zone of no access) and involvement of local communities in PA management.

[3] Data from World Development Indicators, World Bank, Washington, DC (accessed July 20, 2020), https://datacatalog.worldbank.org/dataset/world-development-indicators.

[4] The objective of the National Environmental Action Program (NEAP) is documented in Article 6 of the environmental charter (MEWF 1990 Art.6, 2). The essential objective of the NEAP is to reconcile the population with its environment with a view to sustainable development. To this end, the NEAP set the following objectives: (i) Develop human resources; (ii) Promote sustainable development by better management of natural resources; (iii) Rehabilitate, conserve, and manage the Malagasy biodiversity heritage; (iv) Improve the livelihoods of rural and urban populations; (v) Maintain the balance between population growth and resource development; (vi) Improve environmental management tools; (vii) Help to resolve land issues.

[5] The Ministry of Environment was named 'Ministry of Environment, Water, and Forests' at the start of the project but renamed during the project timeline to 'Ministry of Environment and

Forests. For consistency, we use the name ‘Ministry of Environment’ (as used in the ICR and ICRR).

[6] Specifically, the design of the Third Environment Program Support Project (EP3) financially supported 29 PAs—28 national parks and 1 forest corridor. Most of these PAs already existed at the start of the EP3, but 4 national parks and the forest corridor were created under the project. Moreover, the boundaries of 5 national parks were reassessed during the project timeline. Thus, half of the area supported by the project had been created or redelineated. The project PAs included 11 PAs that received support during EP2.

[7] The objective of the Rural Development Support Project (PSDR) was to increase incomes and reduce poverty in rural areas while preserving the natural resource base. The project sought to support demand-driven activities in agricultural production and technology transfer and strengthen capacity at national, regional, and community levels (World Bank 2001). The PSDR was expected to allocate $1 million of its budget to finance 145 livelihood projects around multiple PAs (Nosy Hara, Nosy Ve, Lokobe, Montagne d’Ambre, Tsaratanana, Ambatovaky, Cap Sainte-Marie; World Bank 2009). Moreover, $1.8 million would be allocated to the environmental and social management plan in the Sahamalaza PA.

[8] Annex 1 of the Implementation Completion and Results Report (ICR) on project costs lacks information on the actual estimate of donor and borrower financing (World Bank 2016b). According to the ICR Review, “the ICR team clarified to the Independent Evaluation Group that it was not possible to obtain this information from the various organizations involved at the time the ICR was drafted” (World Bank 2016a, 7). Note that we estimate the total financing to be around $200.0 million, which includes the actual International Development Association and Global Environment Facility financing of $101.0 million and the $100.0 million contribution of donors and the borrower (estimated) at appraisal.

[9] The Operational Policy / Bank Procedure (OP/BP) 7.30 is triggered when a de facto government comes into power in an unconstitutional manner (World Bank Group Procedure 2014). The World Bank then determines whether to continue or suspend disbursements under existing loans and whether to process new loans or guarantee operation based on a set of criteria outlined in the OP/BP 7.30.

[10] Note, however, that the aide-mémoire of the supervision mission held in August 2009 states that 350,000 persons were affected by the creation of new PAs or extension of existing PAs (World Bank 2009). Accordingly, the document states that the 2008 restructuring included financing to support the environmental and social management plans of 11 PAs and projects to compensate 350,000 persons.

[11] Between 1995 and 2000—that is, between the end and start of the first and second phase of the Environment Program Support Project, respectively— the network of PAs grew from 21 to 46 PAs to cover 1.7 million hectares of land. These 46 PAs covered 5 integral natural reserves, 18 national parks, and 23 special reserves, which fall under the International Union for Conservation of Nature (IUCN) categories of Ia, II, and IV, respectively.

[12] The ICR reports that the efficiency and effectiveness (measured by the Management Effectiveness Tracking Tool) of the management of PAs had increased over time (but only

marginally). Moreover, the project achieved the implementation of surveillance activities aimed at reducing illegal forest activities.

[13] One potential issue is that of "paper parks" where the PAs were pushed into existence by the Durban Vision but later had no partner (for example, NGOs or MNP) to finance the management of these parks. However, data sources available on PA management (financing) do not always provide accurate or up-to-date information.

[14] Freudenberger (2010) reports that *tavy* (slash-and-burn agriculture; see next note) accounts for 80–95 percent of deforestation, and the remaining is caused by wood extraction for fuel and building materials. Local communities further depend on forest products for charcoal production, artisanal mining, and bushmeat consumption, which could lead to the unsustainable management of forest resources.

[15] The generic term of slash-and-burn or swidden agriculture in Madagascar is tavy, but there are two related processes (World Bank 2013). *Tevy-ala* is the initial stage, in which patches of land deep in the forest are cleared and burned to convert forest into agricultural land (for rice production). *Tavy* is the second stage, in which secondary vegetation on previously used fallow land is slashed and burned in preparation for rice cultivation. See also figure D.2 in appendix D.

[16] Land outside PAs refers to the land (that is, forest pixels) located within 5 kilometers of the closest PA border. This is further explained in the section Geospatial Analysis of Project Effectiveness in appendix C.

[17] The ICR reported that the project achieved 36,310 out of the intended target of 86,000 households that would benefit from community development activities (CDAs). Moreover, a beneficiary satisfaction survey collected information and feedback on project-affected people in 10 PAs for which the EP3 directly supported safeguard activities. The results show that most of the project-affected people were unsatisfied with the compensation activities.

[18] For both corridors, information was available on the implementation of safeguard activities (the number of project-affected people and the total cost of activities) at the level of Fokontany. The discussion is limited here to safeguards because there is no information available on the location of non-safeguard CDAs.

[19] For example, the difference between safeguard and non-safeguard supported Fokontany in figure 2.4 is significant for Fandriana–Vondrozo but not for the Ankeniheny–Zahamena forest corridor. Moreover, for Fokontany in Fandriana–Vondrozo that received safeguard support, no relationship exists between (i) the change in forest fire frequency and (ii) the number of project-affected people or the amounts spent.

[20] Tabor et al. (2017) found that when Fokontany surrounding the CAZ receive a development and conservation investment, the Fokontany are more likely to have experienced a lower number of forest fires. However, the authors find that this does not (consistently) lead to reduced deforestation rates.

[21] IEG's evaluation of the EP2 stated that "a key lesson, internalized midway through EP II, and corrected for in the on-going EP III, is that unrealistic objectives and targets can undermine the

credibility of a program. Unclear objectives combined with poor M&E [monitoring and evaluation] often results in a problem project" (World Bank 2004a, xi).

[22] Moreover, the complex institutional landscape and complex roles and responsibilities in both the EP2 and EP3 decreased communication and knowledge sharing between institutions (Risby 2008).

[23] Annex 16 of the Project Appraisal Document (PAD) lists the following criteria that were considered during the prioritization: (i) richness in diversity, (ii) uniqueness, (iii) vulnerability, (iv) irrigated area downstream of PAs susceptible to sand erosion, (v) potential for drinking water supply, (vi) contribution to the protection of a watershed, (vii) frequency of visitors, (viii) tourism potential, (ix) impact on local development, (x) needs in infrastructure and equipment and in management/planning tools, and (xi) financing needs and self-financing capacity (World Bank 2004b). The PAD refers to internal World Bank and external Global Environment Facility documentation on the selection processes, but these documents cannot be retrieved online.

[24] At the same time, large patches of intact forest are easier to protect compared with smaller and fragmented forests, as the forest edges of the latter are more easily deforested given their accessibility.

[25] The PAD states: "A priori, the [EP3] aims at conservation actions. In that respect, EP3 seeks to minimize its negative impacts on biophysical, economic, and social environments while implementing its activities. In addition, it seeks to ensure that the other sectors integrate the environmental dimension and apply mitigation measures in their activities in case of environmental bias" (World Bank 2004b, 156). Moreover, table 2.1 suggests that support under the EP3 prioritized biodiversity conservation over a systematic effort to identify and address the human pressures on natural resources.

[26] In the Borrowers' Comments section of the ICR, it is stated that "[EP3] had a bias toward conservation and against community livelihoods. The Durban vision was in itself a fruit of this vision. Going forward, it is important that farmers' livelihoods and poverty reduction be put at the center of conservation strategies" (World Bank 2016b, 36).

[27] The commitment of the at-the-time president to triple the coverage of the PA system (from 3 percent to 10 percent) at the Durban congress nicely illustrates the persistence of the alignment of global and national interest in the EP3. The increased coverage was needed to satisfy the international target recommended by the IUCN (and thus the global conservation community) but also set the way to attract international attention and foreign aid.

[28] Pollini (2011, 79) notes that "the lack of coordination between the PSDR and NEAP will unfortunately be a recurring topic during EP3's implementation." More generally, many of the interviewees indicated that the cooperation and coordination between the Ministry of Environment and the Ministry of Agriculture was and remains limited.

[29] Generally, livelihood activities can be distinguished between (i) safeguard activities that compensate or restore the livelihood of local communities whose access to natural resources is restricted, (ii) community support activities to improve the capacity and involvement of local

communities in the management of natural resources, and (iii) alternative livelihood activities that introduce behavioral change to reduce human pressure on natural resources.

[30] World Bank projects require safeguard policies to avoid, mitigate, or minimize the adverse environmental and social impacts of investments in, for example, road or irrigation infrastructure. Anyone whose income is negatively affected by the project will receive compensation for the short-term costs of the infrastructure works, which, together with the global, regional, and local investment benefits, will make sure that households will not incur a net loss.

[31] This is explicitly recognized in the project's ICR: "However, the economic analysis shows that even if 100 percent of the additional financing project proceeds used for livelihood development and safeguards are accounted for, this would not be enough to fully compensate the opportunity cost imposed by the project on communities" (World Bank 2016b, para. 109).

[32] Baomiavotse Vahinala Raharinirina, the environment minister of Madagascar, admitted during a workshop in 2020 that "[biodiversity conservation] through Madagascar protected areas' system for 30 years was a failure [and] we have to change the paradigm and to move toward a system which doesn't exclude humans" (Mongabay 2020, para. 2).

[33] The World Bank implemented the Bassins-Versants et Périmètres Irrigués project between 2006 and 2014 that focused on the sustainable management of watersheds (that is, erosion control and afforestation) for irrigated rice development. The project achieved modest outcomes regarding increases in rice yield and the introduction of sustainable land management practices. This, in combination with a low economic efficiency and weak monitoring and evaluation system, resulted in a moderately unsatisfactory rating of the project (World Bank 2015b). The German federal government development bank KfW implemented a similar project, the Programme de Lutte Anti-Erosive, in different phases from 2005 to 2013. The effectiveness of the project was limited because the localized improvements in erosion stabilization achieved were too small compared with the total size of the catchment to introduce significant and sustainable improvements in the supported irrigation perimeters (KfW 2017).

[34] Given that tenure is such an important aspect, it is surprising that the word *tenure* is mentioned five times in the PAD and never mentioned in the project paper of the AF and the ICR.

[35] For example, when the Durban Vision was publicly announced, unclear communication on how the PA system would be expanded incentivized farmers to create tavy fields before the "closure" of the anticipated PAs (Freudenberger 2010). However, once the PAs were created (or received a temporary legal status), regulations would prohibit that household could secure private property within PAs, thus preventing local communities from securing legal tenure rights for individual or customary lands (Ferguson et al. 2014). As a result, the forest was cut down without farmers being able to make secure investments in the land.

[36] Farmers living and cultivating within forested areas prior to PA creation are suddenly confronted with restricted access to their lands that they may have claimed through customary practices using tavy or swidden culture, while certifications to support their potential land rights are not encouraged in or near PAs.

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Appendix A. Project Ratings

Third Environment Program Support Project (P074235)

Indicator	ICR	ICR Review	PPAR
Outcome	Moderately unsatisfactory	Moderately unsatisfactory	Moderately unsatisfactory
Overall efficacy	Modest	—	Modest
Bank performance	Moderately unsatisfactory	Moderately unsatisfactory	Moderately unsatisfactory
Quality of monitoring and evaluation	—	Negligible	Negligible

Note: The Implementation Completion and Results Report (ICR) is a self-evaluation by the responsible Global Practice. The ICR Review is an intermediate Independent Evaluation Group product that seeks to independently validate the findings of the ICR. PPAR = Project Performance Assessment Report; — = not available.

1. Relevance of the Objectives and Design

Objectives

The project development objectives (PDOs) from the development grant agreement were "to improve the protection and sustainable management of critical biodiversity resources at the field level, mainstream conservation into macroeconomic management and sector programs, and facilitate the establishment of sustainable financial mechanisms for the environment, thus contributing to the improvement of the quality of life of the population" (World Bank 2004a, 24). Hence, the original PDO as stated in the development grant agreement has four specific objectives. The Project Appraisal Document (PAD) mentions the same PDOs without the reference to the last objective, that is, the improvement of the quality of life of the population. The development grant agreement further notes that the "IDA [International Development Association] / GEF [Global Environment Facility] financing is geared toward assisting the government of Madagascar in the implementation of selective elements of [the Third Environment Program Support Project (EP3)], for which two subsidiary Development Objectives have been specified: [1] The biodiversity and renewable natural resources of representative eco-regions is conserved and managed on a sustainable footing with active multistakeholder participation; and [2] The framework for sustainable environmental management is further strengthened through the incorporation of said management objectives into public policy making and investments" (World Bank 2004a, 3).

During the project restructuring initiated by the additional financing (AF), the PDOs were formally revised (and approved) as "to enhance the protection and sustainable management of targeted protected areas (World Bank 2011, vii)." For the discussion of project ratings, the Project Performance Assessment Report (PPAR) splits the revised PDO into (i) to enhance the protection of targeted PAs and (ii) to enhance the sustainable management of targeted PAs.

The Global Environment Objectives (GEOs) from the trust fund grant agreement were to "improve the protection and sustainable management of critical biodiversity resources at the field level, mainstream conservation into macroeconomic management and sector programs, and facilitate the establishment of sustainable financial mechanisms for the environment, thus contributing to the improvement of the quality of life of the population" (World Bank 2004b, 23). Thus, the GEOs in the trust fund grant agreement were identical to the PDOs in the development grant agreement. However, according to the PAD, the PDOs were "to contribute to the preservation of the quality of regional and global commons through improved natural resources management and biodiversity protection in critical ecological regions, defined as national PA[s] and their corresponding buffer zones and corridors" (World Bank 2004d, 3). It is not clear why the GEOs are different in the trust fund grant agreement and PAD. The GEOs were not revised during the AF.

Components

The project revised its original components substantially and multiple times over the project's timeline. Table A.1 provides an overview of the different project components—the original and restructured components—and their funding from IDA and GEF. The original components are discussed in paragraph 1.10 and the discussion here focuses on the revised components of the project agreed during the AF.

The Protected Area and Landscape Management component supported the management of 2.7 million hectares of PAs, including three forestry corridors and four additional PAs in addition to those PAs already covered in the original project. The management activities included the provision of technical advisory services and equipment for park surveillance, investment in conservation and tourism infrastructure, piloting of integrated management approaches in one landscape, and support for the institutional reform of Madagascar National Parks (MNP).

The Local Community Support and Development component of the AF is of interest. A first subcomponent on safeguard implementation allocated $6 million to implement monitoring activities in 11 PAs (affecting 26,000 households), evaluate the safeguard plans of 19 national parks (affecting 30,000 households), and design new safeguard plans in two forest corridors (affecting 15,000 households). The second subcomponent focused on community development activities (CDAs) not related to safeguards. It supported surveillance and local development activities of local park committees in all PAs (affecting 9,000 households). Another component of the AF provided support for community forestry management groups for the development of management-transfer plans in the three corridors (affecting 7,500 households). The transfer plan included the implementation of new management-transfer contracts or the extension of the existing contracts. The component also supported natural-resource-based income generation activities in the three newly established forest corridors (Fandriana–Vondrozo [COFAV], Ankeniheny–Zahamena [CAZ], and Makira).

Table A.1. Overview of Project Components and Project Financing

Timing	Action	1st Component	2nd Component	3rd Component	4th Component	Funding
2004	Original design	Forest Ecosystems Management	Protected Areas Management	Environmental Mainstreaming	—	—
	Funding	18	13.5 / 9	8.5	—	40 / 9
2007/08	Restructuring after MTR	Forest Ecosystem Management and Mitigation of Natural Resource Degradation	Protected Area System Management and Biodiversity Valorization	Environmental Mainstreaming	Strengthening Governance and Effectiveness of the Environmental and Forestry Administration	—
Dec. 2009	Restructuring after civil conflict	Selected support to protected areas and implementation of ESSAP	—	—	—	—
	Funding	12	—	—	—	12
Oct. 2011	Restructuring after AF	Protected Area and Landscape Management	Local Community Support and Development	Sustainable Financing Mechanisms for Protected Areas	Project Management, Implementation, Monitoring, and Evaluation	—
	Funding	16	14	9 / 10	3	42 / 10

Note: Funding refers to project funding from International Development Association / Global Environment Facility in $, millions . AF = additional financing; ESSAP= Environmental and Social Safeguards Action Plan; MTR = Mid-Term Review; — = not available.

In addition, the Sustainable Financing Mechanisms for Protected Areas component supported the financial sustainability of the PA network through three main activities. The most important activity was the $10 million endowment (from GEF) and technical assistance to the Madagascar Foundation for Protected Areas and Biodiversity (FAPBM as French acronym) to generate revenues that would cover the recurrent costs of selected PAs. In addition, the component supported the development of ecotourism in selected (high-potential) PAs by investing in ecotourism infrastructure, piloting ecotourism public-private partnership approaches, and developing business plans to optimize revenue generation. Finally, the component also provided technical advisory services to support the preparation and development of market-based mechanisms for PA financing (including payments for environmental services and carbon finance pilots).

Relevance of the Objectives

The relevance of the original EP3 objective to support environmental policy making in Madagascar was substantial at the time of design. The EP3 was the third and last phase of the series of three support projects that operationalized the National Environmental Action Program.[1] The last phase focused on mainstreaming conservation and environmental policy making into the macroeconomy and other rural sectors. This overarching EP3 objective was in line with the Country Assistance Strategy and earlier projects of the World Bank in Madagascar. The objective was also in line with the priorities laid out in the national development policies of the government of Madagascar. The project objectives remain relevant to the current priorities of the World Bank's support for environmental protection outlined in the latest Systematic Country Diagnostic (World Bank 2015) and Country Partnership Framework (World Bank Group 2017).

The relevance of the revised objectives is rated substantial because the objectives of the AF undermined EP3's ability to mainstream environmental policy making (as per the original objective). The much simplified PDO of the restructured project after the AF was clear and straightforward and aligned well with the national development strategies and the World Bank strategies. The Implementation Completion and Results Report (ICR) rated the revised PDO as substantial, but the ICR Review upgraded the revised rating to high because the AF simplified the PDO. However, at the same time, the AF objective lowered the ambitions of the EP3 and diverted the project's objective away from the core EP3 objective to mainstream environmental policy making. The PPAR, therefore, applies the ICR rating of substantial for the relevance of the original and revised PDO.

Relevance of the Design

The relevance of the original design of the EP3 was modest because the design was relevant but overly complex and ambitious. The quality and relevance of the original EP3 design is discussed extensively under Design and Preparation in section 2 of the main text. As discussed in paragraph 1.9, the design of the EP3 incorporated the important lesson from previous EPs that a single project cannot simultaneously address two higher-level objectives (of biodiversity conservation and improved livelihoods). Hence, the EP3 decided to focus its design on providing environmental support at the field and policy level. However, as discussed in paragraph 2.15, the attempt of the project to incorporate both field-level protection and environmental policy making in the same design was assessed as overly complex and ambitious. Moreover, the favoritism of the biodiversity conservation objective resulted in the neglect of human pressures in the project's approach to biodiversity protection and the absence of appropriate coordination mechanisms with other rural development programs.

The design of the EP3 was significantly simplified after the Mid-Term Review and the AF, and the project embarked on a substantially different and considerably narrower operation. The project activities were geared to support the management and financial sustainability of selected PAs at the field level. In line with the revised objective of the AF, the project stopped supporting environmental policy making. Moreover, because of the lack of coordination with other rural development programs, the project had to include safeguard activities to support the livelihoods of project-affected people after the Mid-Term Review. The need to support social safeguard activities became even more pressing when the World Bank suspended its project activities in Madagascar but awarded the EP3 an exemption to implement the Environmental and Social Safeguards Action Plan. Although the risk of a political coup was difficult to anticipate, Madagascar had had an unstable political situation since the early 2000s. The design of the EP3 was revised, with three of the original project components dropped, and the first original component split into new components focusing on PA management, local community support, and sustainable financing. The last component was the Project Management, Implementation, Monitoring and Evaluation.

The revised project design is rated modest because the simplified and narrow project design is in stark contrast with the poor design of safeguard activities to support local communities. The initial strategic decision to exclude livelihood support activities from the original EP3 design had to be revised in the restructured project design. Support for local communities was implemented through generic social safeguards, which suggests that support for livelihood activities was included in the revised project design out of necessity rather than as an opportunity to improve the livelihoods of local communities. Moreover, as discussed in paragraphs 2.24 to 2.31, the safeguard activities were poorly designed and implemented.

2. Efficacy

The PPAR provides a brief discussion of the project's efficacy. The original PDO had four subobjectives, and the PDO was simplified during the AF to have a single objective that coincides with the first subobjective of the original PDO. An overambitious results framework (a total of the 51(!) outcome indicators reported in the ICR), a weak monitoring and evaluation (M&E) system, and the lack of consistent data complicate the discussions of efficacy. Most importantly, the M&E activities for the indicators linked to the original PDOs were stopped in 2009 when the restructured project was given an exemption to Operational Policy / Bank Procedure 7.30. The PPAR, therefore, provides a short discussion of the original and revised first objective, and a brief discussion of the remaining three original objectives.

Objective 1: To Improve the Protection and Sustainable Management of Critical Biodiversity Resources at the Field Level

The first original objective is rated **modest** because, despite the achievement to improve the coverage of the PA system, the project failed to protect biodiversity resources outside the PA system. As mentioned in paragraph 2.4, the main achievement of the EP3 is the increased protection of biodiversity within PAs by increasing the coverage of PAs managed by MNP. This motivated the ICR of the EP3 to rate the achievements on most of the indicators related to improved protection and management at the field level modest. However, the EP3 did not contribute to the protection of biodiversity and the sustainable management of natural resources not protected by PAs (as part of the original objectives). Later on in the report, the ICR acknowledges this and states that "the efforts made to promote sound forest management, reforestation, and combating forest fires [outside PAs] were ineffective in reducing or stabilizing the deforestation rate, or in discouraging the use of wood for fuel or charcoal production" (World Bank 2016b, 22). Thus, the EP3 significantly contributed to protecting biodiversity within PAs but not outside.

Revised Objective 1: To Enhance the Protection and Sustainable Management of Selected Protected Areas

The revised first objective is rated **modest** because the improved coverage of the PA network did not translate into reduced deforestation rates within the project PAs. As mentioned above, the EP3 made a significant contribution in the expansion of the PA network managed by MNP. The ICR further reports some improvements in the management of the PAs in the MNP network. Most notably, it records an increase in the average score from 69 to 72 on the Management Effectiveness Tracking Tool during the AF in the PAs supported by the World Bank but without a counterfactual comparison. However, the PPAR provides evidence that deforestation rates in and outside PAs have increased over time, and that the EP3 has been unsuccessful in reducing deforestation rates. Moreover, temporal changes in deforestation rates have not been different in project and nonproject PAs. Although protection under PAs is more effective in lowering deforestation compared with no protection at all, these results suggest that the mechanisms through which the World Bank has supported biodiversity protection at the field level have no comparative advantage over other institutions.

Objective 2: To Mainstream Conservation into Macroeconomic Management and Sectoral Programs

The mainstreaming objective is rated **negligibl**e because sectoral laws and policies did not adopt environmental sustainability as a key objective. The EP3 addressed the "identified need to better integrate project design with other developments and projects in other sectors (including government, donor and private sector concerns) to achieve true mainstreaming of environmental and rural development concerns" (World Bank 2013, 103). The lack of policy mainstreaming was also identified in the assessment of EP3 (World Bank 2004c). However, the ICR notes that "sector laws and policies have not adopted environmental sustainability as a key objective. Moreover, training programs for government staff by the Ministry of Environment have progressed slowly (with 41 percent of the target being achieved between 2004 and 2009)" (World Bank 2016b, 23). Moreover, the objective of mainstreaming conservation was "poorly defined and measuring achievement was challenging because properly defined indicators were lacking" (World Bank 2016b, 14). The original project had no PDO indicators directly capturing policy mainstreaming. The project restructuring in 2008 added several outcome-level objectives, but data collection and monitoring were of poor quality or absent altogether, especially after the environmental mainstreaming component was dropped in 2009.

Objective 3: To Facilitate the Establishment of Sustainable Financial Mechanisms for the Environment

Sustainable financing of PAs in Madagascar is a major challenge. In 2011, the total annual cost to manage all PAs in the System of Protected Areas of Madagascar (SAPM) was estimated at $18.9 million. The total annual management cost for the PAs governed by MNP, of which 60 percent was supported by EP3, was estimated at $8.4 million (World Bank 2013).[2] A review of the cost, financing, and governance structure of the SAPM in 2012 found that the annual costs for managing PAs were more often determined by funding allocations from donors than by projected future costs (AGRECO 2012).[3] This review also estimated that the total annual cost to manage the SAPM and MNP network of PAs in 2015 would increase to $23 million and $9.6 million, respectively. The management costs in 2019, before the COVID-19 pandemic, were expected to be between $9 and $10 million. From 2003 to 2011, operating expenses accounted for 87 percent of the budget (of which salaries accounted for 49 percent and goods and services for 38 percent) and capital expenses accounted for 13 percent (World Bank 2013).

These management costs are in stark contrast to the revenues generated by MNP. MNP collects the entrance fees from PAs in its network, of which half is distributed to finance development projects for local communities. The remaining half, on average $900,000 per year between 2003 and 2011, contributed directly to MNP's budget. Combined with revenues from other tourism services, tourist revenues covered less than 20 percent of the annual operating costs of the PAs (World Bank 2011; World Bank 2013). This results in a budget gap of nearly $6 million. MNP struggles to cover the additional costs related to inflation, the expansion of their PA network, and the need for compensatory payments to communities within new PAs (AGRECO 2012). Consequently, the MNP was and remains highly dependent on external financial support (World Bank 2013). Between 2004 and 2011, the estimated average annual contribution to the MNP budget from EP3 and another donor was $5 million and $3.5 million, respectively. In 2011, the support from other donors covered three-fourths of MNPs budget.

To support the weak financial resources in the SAPM, the EP3 contributed to the establishment of the FAPBM in 2005. The fund strives for the financial sustainability of Madagascar's PAs and biodiversity by supporting recurrent managerial costs of PAs. The capital of the fund has been provided by bilateral and multilateral donor agencies. The German and French governments have been the main contributors to the fund (almost $50 million) and the EP3 contributed $17.5 million to the FAPBM (World Bank 2013). The FAPBM aims at generating a 4.5 percent annual net return to the fund in the long term (World Bank 2011). These incomes from interest are expected to cover the recurrent costs of managing PAs as well as essential financial gaps of the PAs.[4] In 2019, the FAPBM supported 36 selected PAs or 30 percent of the 122 PAs in the SAPM. This included 22 PAs managed by MNP and 13 new PAs managed by nongovernmental organizations (NGOs), where it also addresses some of the needs of local populations (FAPBM 2019). The selection of PAs is based on a set of criteria (of which biodiversity richness and the funding gap are the most important) and subjected to a due-diligence and field verification (FAPBM 2010).

However, the returns to the capital invested in the FAPBM are insufficient to bridge the budget gap of managing the SAPM. The annual report of the FAPBM documents that $75 million was capitalized in the FAPBM in 2019 (FAPBM 2019). This capital generated $1.9 million funding from capital revenues. Thus, the annual interest generated from the FAPBM capital provided less than 10 percent of the current management cost of the entire network of PAs in the SAPM (Jones, Rakotonarivo, and Razafimanahaka forthcoming). For the 13 new PAs, the FAPBM investment revenues contributed to 29 percent of the financial needs. In these PAs, most funds were used for conservation activities (40 percent on patrolling, boundary delimitation, and ecological surveys) and recurrent costs (42 percent on salaries and operating costs of the NGOs). In MNP-managed PAs, FAPBM contributes to payroll expenses and some operating costs and has a special intervention fund that provides emergency funding when the ecological integrity of the PA is endangered. However, the annual report mentions that that "in 2019, many MNP protected areas did not receive sufficient funding to implement all of the 2019 annual work plan (AWP) activities" (FAPBM 2019, 18). Thus, overall, the FAPBM has contributed only a little to address the budget gap of the FAPBM and especially of the MNP.

Madagascar has a comparative advantage to build an industry of ecotourism or nature tourism around its unique biodiversity. The contribution of tourism and travel has been significant for the economy at over 15 percent of gross domestic product in 2018 and growing per year.[5] Ecotourism development also has the potential to improve the livelihoods of local populations affected by PAs. This is especially true for PAs with good access, organization, and facilities for tourists, as illustrated by the success stories for tourism in Andasibe-Mantadia National Park near the capital and Nosy Tanikely adjacent to Nosy Be (a previously well-established and prime pole for tourism supported by the World Bank). Although half of the visitor entry fees are earmarked for PA management, the remaining half is intended to be distributed to local communities for development projects (World Bank 2013).

The development of ecotourism in Madagascar has not lived up to its expectations. Tourism revenues are sensitive to the political instability in the country (World Bank 2013) and COVID-19-related travel restrictions hold tourists back. Moreover, tourism in Madagascar's PAs is highly concentrated: Five parks receive 90 percent of the total number of visitors (Desbureaux et al. 2015). Most remunerations from this industry are absorbed by professional operators from elsewhere, who can provide the host of necessary services. Local communities may have some advantages to provide services such as local guides and labor, and some handicraft sales, although these opportunities are likely to be susceptible to the capturing of benefits by selected groups of local elites. Moreover, because of the lack of funding and regulation, little of the intended half of park entry fees are redistributed to local communities. Moreover, the limited overall budget ties the hands of PA managers to implement projects at the community level (Desbureaux et al. 2015). For example, in the 13 new PAs supported by FAPBM, the support for development activities for local communities accounted for only 8 percent of the FAPBM's investment. Meanwhile, most local communities affected by PAs are in isolated and remote areas, far from contact with tourism and associated benefits.

The achievement of the EP3 to the third original objective is rated **modest.** The ICR rated the achievement on the outcomes related to Sustainable Financing Mechanisms for Protected Areas **modest**, and this rating remains valid today. Overall, the FAPBM financing remains insufficient, tourism is underdeveloped, and the SAPM cannot achieve sustainable financing. The financial sustainability of the PA system was already a concern shared by many donors at the start of EP3 (Risby 2008). Financial sustainability is even more problematic for the more isolated and less popular parks. On top of that, travel restrictions imposed by the COVID-19 pandemic highlight the dependency of some PAs on foreign tourism. These revenues have disappeared in 2020. Therefore, the FAPBM has been forced to launch emergency support for PAs but at the same time make drastic financial cuts.[6]

Objective 4: To Contribute to the Quality of Life of the Population

The EP3 implemented livelihood-supporting activities mainly through social safeguards, and this turned out to be a significant challenge. The original project design did not support livelihood activities but relied on the Rural Development Support Project (PSDR) to implement CDAs. The PAD of the EP3 states that "the [Ministry of Environment] has already signed a protocol with the [Ministry of Agriculture] to ensure coordination with the large World Bank–funded rural development operation (PSDR) for sustainable development activities in protected areas buffer zones and eco-corridors" (World Bank 2004d, 28). However, the PADs of the EP3 (World Bank 2004d) and PSDR (World Bank 2001) do not mention whether the selection of PAs in the EP3 considered the presence of PSDR activities and, conversely, whether the targeting of project activities in the PSDR considered the supported PAs. Interviews with World Bank staff indicated that the EP3 submitted and discussed action plans of social safeguards with the PSDR. However, as mentioned in paragraph 2.23, the implementation of PSDR was not very well coordinated with the EP3.

The project included community development and safeguard activities later in its project components, but an AF was needed to cover the financing gap as these activities were not budgeted. These activities were poorly designed and underfunded (see paras. 2.25 and 2.28). Box 2.2 describes the fundamental issues with the safeguard design and implementation that made safeguard activities inefficient in the CAZ. Less than half of the households adjacent to PAs had benefited from biodiversity protection. According to the ICR, this was "due to implementation issues: MNP[']s limited capacity to perform community development work, and lack of appropriate control on service providers leading to less than optimal allocation of resources and ineligible expenditures" (World Bank 2016b, 23). At the time of project closure, more than 15,000 of the 23,000 identified project-affected people were not fully compensated. Therefore, the last restructuring of the EP3 AF in December 2015 had to allocate $2.9 million to a sinking fund to support compensation activities. The management of the sinking fund and implementation of activities was governed by the FAPBM, MNP, and NGOs managing the affected PAs. Thus, it is only with the help of the sinking fund that the project could compensate the project-affected people identified by the project.

The rating on the fourth original objective is **negligible** because the EP3 did not introduce any meaningful improvements in the livelihood of local communities that depend on forests and their resources. The PPAR fully agrees with the following statement made in the ICR: "Other than ecotourism, few, if any, meaningful results were achieved regarding the development of economic opportunities valuing biodiversity and making it an engine of sustainable economic development" (World Bank 2016b, 21).

Overall Efficacy

The overall efficacy of the EP3 is rated **modest.** The PPAR concludes that the achievement of the project to improved management of biodiversity conservation at the field level and sustainability of the PA system was **modest.** This project achieved **modest** ratings on the first original PDOs, the revised single PDO, and the third original PDO. On the contrary, the project had a **negligible** achievement regarding the original PDOs to mainstream environmental policy making (PDO 2) and improve quality of life (PDO 4). The overall efficiency rating of **modest** corresponds to the combination of the individual ratings of these (revised) PDOs.

3. Efficiency

Economic and Financial Analysis

The PAD assessed project efficiency using a detailed and careful ex ante economic and financial analysis. The efficiency assessment used a detailed cost-benefit analysis accounting for negative income effects from restricted forest access. The anticipated benefits of the project included biodiversity conservation, ecotourism, watershed protection, carbon finance from reducing emissions from deforestation and forest degradation programs, sustainable fuelwood collection, and sustainable nontimber forest product collection. The project differentiated the occurrence and level of these benefits between different forest management modalities: (i) PAs, (ii) conservation sites (or corridors), and (iii) Management-Transfer Sites (or community-based forest management). The project costs considered in the analysis were the management costs and the forgone revenues from unsustainable agricultural practices, firewood collection, and nontimber forest product collection. The project made different assumptions on the projected deforestation rates, agricultural yields, natural forest management costs (depending on the forest management modalities), and the global, national, and local benefits from sustainable natural forest management.

Although the ex ante analysis shows that the project was economically viable, the ex post analysis does not. The PAD estimated an economic rate of return and net present value (NPV) of 25 percent and $16.7 million, respectively. The ICR updated the assumptions of the PAD on deforestation rates and the management costs of forest management modalities. For example, the PAD assumed that no deforestation would occur in PAs and conservation sites, which is not only unrealistic but also conflicts with the project target to half of the deforestation rate of 0.44 percent. Instead, the ICR uses more recent project data in the efficiency analysis and reports a NPV of −$4.6 million. This negative outcome results from the higher-than-expected revenues forgone by farmers from restricted access to forests. These higher costs outweigh the lower per-unit management cost of PAs. However, the ICR states that the NPV becomes positive if the analysis assumes a higher global value of biodiversity ($3.425 per hectare instead of $3 per hectare). Although it is important to assign a meaningful global value to biodiversity, the benefits to farmers at the local level are likely to have been insufficient—if not absent—to compensate for restricted forest access in the short run.

Although it is laudable that the ICR updated the efficiency analysis using project data, the cost-benefit analysis and its updated assumptions have a conceptual flaw. The updated assumptions on deforestation rates in and outside PAs in the ICR diverge from the average deforestation rates measured in the most recent forest-cover data. The summary statistics reported in table C.2 in appendix C show that deforestation rates are about four times higher inside PAs and more than half outside PAs than assumed in the ICR analysis. However, accounting for these incorrect deforestation rates would illustrate the conceptual limitations of the simple cost-benefit analysis. Namely, higher deforestation rates in PAs would mean that the income farmers forgo from abandoning *tavy* is less than assumed. Hence, the project's cost will be lower than what is now reported in the ICR, and the project might become economically viable.[7] Thus, the failure of reducing deforestation rates might act as a double-edged sword in the efficiency analysis: Higher deforestation rates lead to lower efficacy but higher efficiency.

Administrative and Institutional Efficiency

The EP3 faced administrative and institutional inefficiencies related to the slow implementation of the project. The ICR identifies delays in the transfer of funds, institutional reforms of critical environmental agencies, weak capacity and governance of implementation agencies, and delayed recruitment, contracting, and procurement as factors that slowed down the implementation of project activities. The project was coordinated by the Project Coordination Unit but implemented by different agencies belonging to different ministries (see para. 1.12). Such interministerial cooperation can have potential advantages but often does not work when there are power plays between ministries to control sectoral finances. The ICR notes that "inter- and intra-coordination between and within government agencies, the executing agencies, the donors, and NGOs remained weak" (World Bank 2016b, para. 229).

The political climate was unstable, with six environment ministers and a prime minister as acting minister during the project timeline. Political events included the political coup in 2009, the establishment of a de facto transition government in 2010, a newly elected government in 2014, and a reshuffle in the government in 2015 (World Bank 2016b). Thus, for example, at the end of the project, there were two different prime ministers and two different environment ministers in office. Although the project did not work directly with the government after the coup, this political instability hampered project implementation because of the frequent shuffling of key staff in the ministries. There was no ownership by the government and delayed official approvals of project activities. Moreover, institutional and human capacity building within the government was limited. Finally, the design and implementation of community development and safeguard activities faced substantial shortcomings that reduced the project's efficacy.

Efficiency Rating

Because of the uncertain financial viability of the EP3 and the administrative and institutional inefficiencies, the efficiency of the original and revised project is rated **modest.**

4. Outcome

The overall outcome of the EP3 is rated **moderately unsatisfactory.** The rating for the overall outcome is based on the individual ratings for relevance, efficacy, and efficiency. Per the Independent Evaluation Group (IEG) guidelines, a rating of **substantial** for relevance of objective, **modest** for efficacy, and **modest** for efficiency results in a rating of **moderately unsatisfactory** for the project's overall outcome. This rating reflects the additional evidence from IEG's assessment of geospatial data, secondary household-level data, academic and policy literature, and qualitative information from interviews with key stakeholders. Table A.2 provides an overview of the ratings for relevance, efficacy, efficiency, and the overall outcome by the ICR, ICR Review, and PPAR.

Table A.2. Project Ratings on Relevance, Efficacy, Efficiency, and Overall Outcome

Indicator	Version	ICR	ICR Review	PPAR
Relevance of objectives	Original	Substantial	Substantial	Substantial
	Revised	Substantial	High	Substantial
Relevance of design	Original	Modest	Modest	Modest
	Revised	Substantial	Substantial	Modest
Efficacy	Overall	Modest	—	Modest
	PDO 1	Modest	Modest	Modest
	Revised PDO 1	Substantial	Modest	Modest
	PDO 2	Modest	Negligible	Negligible

Indicator	Version	ICR	ICR Review	PPAR
	PDO 3	Modest	Modest	Modest
	PDO 4	Negligible	Negligible	Negligible
Efficiency	Original	Modest	Modest	Modest
	Revised	—	Modest	Modest
Outcome	Overall	MU	MU	MU

Source: Independent Evaluation Group.
Note: "Original" refers to the original project, before the additional financing. ICR = Implementation Completion and Results Report; MU = moderately unsatisfactory; PPAR = Project Performance Assessment Report; PDO = project development objective; — = not available.

5. Risk to Development Outcome

The political, financial, and governance risks to the development outcomes of EP3 have remained or even become aggravated over time. The ICR and ICR Review identified several high risks to the development outcomes: elimination of ownership by the government, continued financial dependence on donor support, and lack of institutional support for MNP once the EP3 ended. These risks remain high and are even exacerbated by the increasing deforestation rates and disruptions to the tourist sector due to the COVID-19-imposed travel restrictions for the most touristy PAs of Madagascar.

A particular risk, as explained in paragraph 2.22, is the current focus on protecting marine habitats instead of forest habitats. This might illustrate that the priorities of biodiversity conservation have shifted to showcasing quick and demonstrable environmental gains. In 2014, Madagascar committed to tripling its surface of marine PAs. As a result, donor support moved from protecting terrestrial national parks to coastal and marine national parks. The World Bank, for example, supports the management and conservation of fish populations in Madagascar through the SWIOFish2 project in the southwest Indian Ocean (World Bank 2017). Such efforts suggest that donors are retargeting support from forest habitats under immense human pressure toward marine habitats where species are more likely to recover when protected within large and relatively less conflictual areas in open sea (Mongabay 2017). Thus, the focus of biodiversity conservation remains on conserving habitats but steered toward those where conservation gains are faster to realize and easier to demonstrate. It might also illustrate the realization that terrestrial PAs cannot be saved from human threats. The consequence is that donors devote fewer conservation resources and less attention to the protection of forest frontiers, which remain the hot spots of biodiversity losses.

6. Bank Performance

Quality at Entry

The quality at entry is rated moderately unsatisfactory as there were substantial issues with the quality of the original project design. As explained in paragraph 2.15, the project was overly complex, unrealistic, and too ambitious. There were also significant challenges with the M&E system, as explained in section 8 of this appendix, Quality of Monitoring and Evaluation. For these reasons, both the ICR and ICR Review rate the quality at design as **moderately unsatisfactory** and the PPAR maintains this rating.

Quality of Supervision

The quality of supervision is rated **moderately unsatisfactory** as the project supervision was unsuccessful in detecting ineligible spending, fraud, and delays in safeguard activities. Because the project took 11 years to come to closure, different task team leaders had been responsible for project supervision. The ICR assessed supervision as **moderately unsatisfactory** but the ICR Review upgraded the rating to **moderately satisfactory.** The ICR Review argues that the AF simplified the project design and the project team had to deal with many uncertainties related to the difficult political climate. Although this is certainly true, supervision failed to timely identify substantial amounts of ineligible expenses and fraud. It also was not able to coordinate with the other World Bank projects in the rural sector to carry out the livelihood activities. Moreover, most of the project-affected people were not compensated by the end of the project: The unsustainability of the safeguard approach is discussed in paragraphs 2.28 to 2.30. The weak M&E system was also not addressed throughout the project. The PPAR, therefore, maintains the **moderately unsatisfactory** rating of the ICR for the quality of supervision (see summary of ratings in table A.3).

The overall rating of World Bank performance is, therefore, **moderately unsatisfactory.**

Table A.3. Overall Rating of World Bank Performance across Reviews

Stage	ICR	ICR Review	PPAR
At entry	MU	MU	MU
Supervision	MU	MS	MU
Overall	MU	MU	MU

Source: Independent Evaluation Group.
Note: ICR = Implementation Completion and Results Report; MS = moderately satisfactory; MU = moderately unsatisfactory; PPAR = Project Performance Assessment Report.

7. Borrower Performance

Government Performance

The government performance is rated **unsatisfactory.** The government made a high-level political commitment by signing the Durban Declaration in 2003, one year before the EP3 started. In the Durban Vision, the government of Madagascar committed to tripling the coverage of the PA network and to curbing the illegal exploitation of precious woods. However, the ICR assesses that these high-level commitments were not translated in adequate support at the operational level (World Bank 2016b). The public budget allocated to PA management was negligible, the number of law-enforcing agents in the field was low, and the law regulating La Gestion Locale Sécurisée contracts to transfer land to local communities was implemented unequally. However, the decision of the World Bank and other development partners to suspend financing to the government of Madagascar in response to the 2009 political crisis contributed to this poor performance.

Implementing Agency Performance

The implementing agency performance is rated **moderately unsatisfactory.** The performance of the implementing agencies was mixed. The Project Coordination Unit (Cellule de coordination de PE3) coordinated the implementation activities of the EP, but its performance was unsatisfactory. The ICR refers to issues with preparedness for project implementation, actual project implementation, fiduciary and procurement issues (see appendix B) and the low quality of the M&E system (see the next section). The performance of the parastatal agency MNP (previously ANGAP) was also unsatisfactory because of frequent delays and low implementation quality of infrastructure construction works and CDAs. In contrast, the FAPBM performed satisfactorily because of its coordinated efforts with other partners. Similarly, the NGOs responsible for the management of forest corridors in the MNP network executed their contracts in a timely manner and their performance was therefore moderately satisfactory.

The overall borrower performance is rated **unsatisfactory.**

8. Quality of Monitoring and Evaluation

Design

The original results framework and the M&E system were overly ambitious and complex, reflecting the complexity of the original PDOs. Initially, when the PAD was prepared, a results framework was not required. The ICR presents an original results framework that contained 15 PDO indicators, of which some were poorly or ambiguously defined (World Bank 2016b, para. 53). Moreover, these indicators had overambitious targets even though the EP2 learned valuable lessons on the importance of realistic indicator targets. Another critique was that the M&E system lacked "indicators of long term program impact; an important oversight given the long-term nature of many of the expected program outcomes" (World Bank 2013, 103).

The AF substantially revised and simplified the results framework and M&E system. This resulted in dropping many of the original PDO and outcome indicators while adding new indicators. However, the M&E remained weak because the monitoring of many outcomes remained incomplete (World Bank 2016b, para. 54). The lack of an outcome indicator on human development, in itself, is a significant design issue (and was not corrected for in the AF), illustrating a weak results framework focused on measuring the effectiveness of biodiversity conservation only.

Implementation and Use

The implementation and use of the M&E system was also weak. The Project Coordination Unit was responsible for the management of the M&E system. The many project indicators put a large burden on the frequent reporting required by implementing agencies. This resulted in reporting delays and data inaccuracies. The quality and speed of the M&E reporting was, therefore, poor and inaccurate. The ICR mentions that between the political coup and the AF, indicators were not being tracked (World Bank 2016b, para. 54). Because of the weak design of the M&E and its slow and inaccurate reporting, the project team did not meaningfully use the M&E system to guide project decisions.

The M&E quality is rated **negligible.**

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Notes

[1] The main National Environmental Action Program objective as translated from Article 6 of the environmental charter is "to reconcile the population with its environment with a view to sustainable development. To this end, the plan sets itself the following objectives: (i) Develop human resources; (ii) Promote sustainable development by better management of natural resources; (iii) Rehabilitate, conserve and manage the Malagasy biodiversity heritage; (iv) Improve the living environment of rural and urban populations; (v) Maintain the balance between population growth and resource development; (vi) Improve environmental management tools; (vii) [Help] to resolve land issues." (MEWF 1990 Art.6, 2-3)

[2] The total annual cost to manage the protected areas (PAs) not governed by Madagascar National Parks (MNP) was $10.5 million in 2011. However, as the latter group of PAs covers a larger surface, the annual management cost of MNP-managed PAs ($3 per hectare) was larger than the cost of PAs managed by nongovernmental organizations ($2.6 per hectare). These average management costs of PAs in Madagascar are high but of similar magnitude compared with other developing countries including the African region.

[3] Although a reform of MNP aimed to strengthen management partnerships with local communities and decentralize administration with technical and scientific support, the review found that the majority of PAs remained governed by the head office. Partners and local structures managed only a minority of PAs. The review also found that the most influencing factors for PA costs were PA size and International Union for Conservation of Nature categories, but that the type of ecosystem or the level of threat had no significant effect on costs. PAs in International Union for Conservation of Nature category II (national parks) are the most costly because tourism demands and access require significant investment. The management of PAs in category V (people and nature landscape areas) with regional participation was often the least costly, but threat levels in remote areas are higher compounded by fewer tourists and thus lower gate fee benefits.

[4] If the interest is insufficient to cover the annual operational costs, La Fondation pour la Biodiversité et les Aires Protégées de Madagascar can draw on the capital when the financing is necessary for the preservation of biodiversity. To date, this has not yet occurred.

[5] Source: Price Index, Knoema Corporation (accessed September 17, 2020), http://knoema.com/atlas/Madagascar/CPI-inflation.

[6] In September 2020, La Fondation pour la Biodiversité et les Aires Protégées de Madagascar provided a special grant of nearly $30,000 to the local communities of the 36 project PAs. On top of that, the PAs in the MNP network have received special support of $250,000, and $20,000 has been provided to individual PAs as emergency aid at their request.

[7] This reasoning abstracts from the reduced global and local benefits from biodiversity conservation when deforestation rates are lower, which would balance out part of the reduced costs.

Appendix B. Fiduciary, Environmental, and Social Aspects

Financial Management

The financial management of the project was unsatisfactory because of the large amount of ineligible spending and undocumented expenditures related to CDA supported by the AF. More specifically, these financial mismanagement issues concerned the implementation of CDA not related to safeguards (under component B of the AF) around PAs managed by MNP. In 2014, the World Bank implemented a postprocurement review of contracts executed by service providers (World Bank 2014). The review detected irregular practices in a large number of small contracts. After this internal audit of procurement contracts, nonsafeguard community development activities were stopped (World Bank 2014). An external and independent "value-for-money" audit identified potential ineligible or questionable expenditures of $2 million. The subsequent review initially identified potential ineligible expenditures of $400,000 and potential fraud of $300,000 (World Bank 2015). The financial management team revised the total amount of ineligible expenses later to just over $300,000.

The Implementation Status and Results (ISR) report of October 2014 also states that "in 2010, a special audit of the MNP Northern Directorate financed by the EP3 established that USD 0.5 million were misappropriated, with the bulk of the fraud perpetrated in 2008 and 50 percent of the misappropriated funds originating from the Global Environment Facility grant and the other half from the government's budget. The full amount of misappropriated funds has now been refunded to the World Bank, and no further frauds have reported" (World Bank 2014, 33). The ICR, however, does not mention the discovery of ineligible expenses in 2008. These fiduciary issues illustrate that the project faced financial mismanagement throughout the project timeline.

Procurement

Fiduciary compliance was of low quality. The project prepared procurement plans late and their implementation was slow. Issues with procurement and recruitment of contracts aggravated over the project time. The procurement anomalies and irregularities discussed in paragraph 2.26 give rise to the unsatisfactory financial management of the project. The last ISR report rated procurement as unsatisfactory. This is because procurement capacity was found weak during the entire project cycle, despite recommendations from earlier procurement review to address procurement weaknesses (World Bank 2014).

Environmental and Social Safeguards

The original project was classified as Category B and triggered four safeguard policies: OP 4.01 (Environmental Assessment), OP 4.04 (Natural Habitats), OP 4.10 (Indigenous Peoples), and OP 4.12 (Involuntary Resettlement). The World Bank approved and publicly disclosed the Environmental and Social Management, Process Frameworks, and an Indigenous Peoples Plan. The performance regarding environmental safeguards was satisfactory. However, the performance regarding social safeguards was unsatisfactory. As discussed extensively in paragraphs 2.24 until 2.31 of the main text, safeguard activities are insufficient and inappropriate instruments to promote the sustainable and long-term use of forest resources. Safeguards have expensive, ineffective, and time-consuming targeting procedures that can trigger social tension between eligible and ineligible poor households. Eligible households perceive the value of compensation often insufficient and safeguard activities not adapted to the complex farm realities or cultural traditions. Finally, the simple, one-time, and supply-side support to farming does not address the fundamental problem of low soil fertility that is a major driver of deforestation in Madagascar.

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Appendix C. Methods and Evidence

This report is a Project Performance Assessment Report. (PPAR). This instrument and its methodology are described at https://ieg.worldbankgroup.org/methodology/PPAR.

The method of the PPAR is mainly based on the analysis of geospatial data on forest cover, the location of PAs, World Bank support, and drivers of deforestation in Madagascar. The PPAR also makes use of secondary data collected on households living in and around PAs in Madagascar. This appendix explains the different steps in the methodology applied and the data sources consulted. It also explains how project effectiveness is defined and identified in the data.

Geospatial Evaluation Methodology

Construction of Geospatial Data Set

The unit of observation in the geospatial analysis is the 1-square kilometer (km^2) pixels representing the earth surface of Madagascar. We narrow this sample of **surface pixels** to an analytical subset of pixels covered with (sufficient) forest using the following selection criteria: First, we select the subset of surface pixels that are located within PAs or the buffer of 50 kilometers around each PA. We do this to retain the land that is within or close by PAs. Second, this subset is further refined by retaining the surface pixels covered by a sufficient amount of forest in (either) 1953, 1990, or 2015. We use the following threshold: surface pixels are retained if at least one-third of the surface pixel is covered with trees. As a result of this refinement, a pixel in the analytical sample is the squared kilometer of land surface within or (50 kilometers) around a PA covered with trees for at least one-third of the pixel in either 1953, 1990, or 2015. We refer to this analytical sample as **forest pixels** in the remainder of the text.

The analytical sample uses this layer of forest pixels to perform calculations. We collect information on indicators relevant to the analysis from different data sources. We merged all this information to this pixel layer to create the **geospatial data set**. As such, this layer combines all the information on forest cover, geography, climate, and agroecology that is available at the squared kilometer level. On the contrary, the basic information of the PAs, as well as the support they received, is available at the PA level. These data were obtained from global databases and project documents. Hence, we have information available at the level of the forest pixel and the level of the PA, and we will explore both levels.

Geospatial Analysis of Project Effectiveness

Most of the geospatial analysis is done at the PA level. To do so, the information at the squared kilometer level is aggregated at the PA level, by calculating the average or median value of the information for all forest pixels that are located within the PA. Thus, for each PA, we have an average value for the forest, geographical, climatological, and agroecological information aggregated from the pixels that belong to the PA. This is information combined in the geospatial **PA data set**. For each PA, we further want to know what is happening around the border of the PA. We, therefore, collect information on forest pixels that are located within an area 5km outside of the PA boundary. We do so by calculating average values of the group of forest pixels that are located within 5 kilometers of both sides of the PA border they belong to or are closest to, respectively. We refer to these pixels as inside and outside PA border pixels, respectively.

The effectiveness of the EP3 support is measured by looking at the extent to which the support reduced deforestation rates in PA. Other measures of biodiversity conservation exist for terrestrial PAs, but the availability of geospatial data on forest cover allows for an annual assessment of deforestation rates. The effectiveness is then identified as a difference-in-difference in deforestation rates. First, the difference-in-difference compares the deforestation rates of a PA before and after the project was implemented. The time-series of observations for most information allows looking at changes over time rather than the level in a given year. This controls for common time trends in the indicator of interest. The long-term change in deforestation rates is measured as the difference between average annual deforestation rates for the years 2015–17 (after the project) and the average annual deforestation rates for the years 2000–05 (before the project).

Second, the difference-in-difference compares the change in deforestation rates between project PAs with nonproject PAs. The project information on EP3 support for PAs allows us to classify PAs (and the forest pixels it contains) as those that received support from the EP3 and those that did not receive support. The World Bank supported 33 PAs through EP3. There are 124 additional PAs in the World Database for PAs in Madagascar. The availability of geospatial data on locations outside the project intervention area allow us to construct a counterfactual situation for the support provided by the EP3.

The group of project PAs might be systematically different from those not supported. To make the comparison of these two groups more meaningful we retain a subset of PAs that are similar in characteristics. First, from all 100 terrestrial PAs in Madagascar recorded in the database (see below), we keep terrestrial PAs with sufficient forest coverage to compare PAs that protect substantial forest habitats (and not, for example, marine habitats). Second, we retain PAs located in climate zones and protected under a similar IUCN class for which there are sufficient PAs of both support types. For example, we include all strictly protected and multiple-use PAs in the humid zone because this group of PAs contains PAs supported and not supported by the EP3. On the contrary, we keep only the strictly protected PAs in the subhumid and semiarid zones as they do not contain project PAs with multiple-use supported by the EP3. As a result, we retain a subset of 45 PAs that are comparable in terms of habitat (forest), climate, and protection status. Although this restriction should improve the comparability of the PAs analyzed, the number of observations drops considerably. The analytical sample includes 23 PAs supported and 22 PAs not supported by the World Bank. There is a trade-off in the precision and accuracy of the difference-in-difference estimation.

Descriptive statistics measured at the PA level are weighted by the size of PAs. This means that, for example, average deforestations rates for PAs in a certain group are weighted by the number of forest pixels in each PA. We do this because indicators measured at the PA level are average values of pixel-level values, and the number of pixels differs between PAs because of differential sizes. Larger PAs are given more weight in calculating average outcomes because the average value of deforestation for these PAs is more precisely measured. However, at the same time, this means that larger PAs have a stronger influence on the average deforestation rates in the two subgroups based on EP3 support.

To assess whether any differences in the averages between the two groups are significantly different from zero, we estimate the difference-in-difference in a regression framework:

$$\Delta\,\theta = \alpha + \beta * EP3 + controls + \varepsilon \qquad 1$$

The dependent variable $\Delta\,\theta$ is the long-term change in deforestation rates for a PA. The measurement of θ is defined in equation 2 below. On the right-hand side, the "EP3" variable is a dummy indicating whether the PA received support from the EP3, and "controls" refers to a set of indicators representing PA characteristics (size, year, climate zone, and protection status) and locational drivers of deforestation (as defined below). The latter are included to control for some of the systematic differences that might exist between the PAs in the two groups. Note that β indicates the correlation between changes in deforestation rates of PAs over time and the support PAs received from the project. β should not be interpreted as a causal effect of project support on changes in deforestation rates.

Heterogeneity in Project Effectiveness

The effectiveness of the EP3 to reduce deforestation rates is expected to heterogeneous depending on the type of PAs that were supported. The typology of PAs is based on two dimensions: the (dominant) climate zone and the IUCN classification. The climate determines the type and value of the forests and its resources (including the soil). The PA protection status determines the extent to which these forest resources are shielded from human influence (in theory). In terms of climate, the PAs can be located in the humid, subhumid, and semiarid zone. Regarding the IUCN classification, PAs are grouped depending on whether access to the PA was restricted (IUCN classes I-IV) or multiple-use (IUCN classes V and VI) was allowed in the PA. Using these two dimensions, different groups of climate-access were created, and equation 1 was estimated for each group separately.

The results of the subgroup analysis seem to suggest that there is no consistent pattern in how project effectiveness is affected by (the combination of) climate and protection status. Although the effectiveness of the project PAs is lower in the humid zone compared with subhumid and semiarid zones, the opposite is true for nonproject PAs. Similarly, within the humid zone and project PAs, deforestation rates in the decentralized management model of the multiple-use PAs are higher compared with strictly managed PAs. However, this is not the case for nonproject PAs. Moreover, there is no indication of a differential implementation of the project in the different climate-access groups. For example, there is no subgroup difference in terms of the perceived hydrological or tourist potential of PAs or the support received during the earlier phases of the NEAP. However, detailed project information is scarce. Hence, it seems unlikely that the basic characteristics of PAs or the differential support provided by the project are the main driver of heterogeneity ineffectiveness. This suggests that the differential effectiveness could be related to the underlying drivers of deforestation, and this is what is analyzed in figure 2.3.

Subgroup Comparison

To understand which factors drove the selection of PAs to be supported by the EP3, we compare supported and nonproject PAs along a wide set of biodiversity, agroecology, and socioeconomic indicators. The indicators under consideration are listed in Table 2.1. To make the subgroup comparison, the average values of the indicators are presented for the groups of supported and nonproject PAs. Then, a simple t-test is performed to test whether the difference between the two groups is statistically significant. This subgroup comparison in table 2.1 Table 2.1, for example, shows that project PAs are—on average—located at higher altitudes, farther away from the nearest city, and on terrain with steeper slopes. All these factors are hypothesized to reduce the ease of how farmers can access and use the forest for their livelihoods.

Data Sources

This section describes the different information and their data sources in detail. Table C1 provides a short overview.

Table C.1. Overview of Data Sources

Data	Measurement at Pixel Level	Measurement at PA Level	Source	Years
Forest cover	Tree coverage (yes/no)	Total forest coverage within the PA (km^2) = sum of all pixels covered with trees within the PA	Vieilledent et al. (2018)	1953, 1973, 1990, 2000, 2005, 2010, 2015, 2017
Forest fires	Number of forest fires in a year (number)	Forest fire frequency (percent) = total number of forest fires in pixels within the PA divided by the area of the PA	Fire Information for Resource Management System[1]	2001, 2005, 2010, 2015
Crop yield	Estimated yield level (ton/ha) for rice and maize	Average value of crop yield (ton/ha) for pixels within the PA	Spatial Production Allocation Model[2]	2000, 2010
Population pressure	Number of people per pixel (number)	Total number of people (number) summed over all pixels within the PA	Global Rural-Urban Mapping Project[3]	2000, 2005, 2010, 2015
Travel time	Travel time (minutes) to nearest city of 50,000 inhabitants	Average value of travel time (minutes) for pixels within the PA	Weiss et al. (2018)	2015
Coast distance	Distance (km) to nearest coast	Average value of distance (km) for pixels within the PA	Global Administrative area database[4]	
Mine distance	Distance (km) to nearest coast	Average value of distance (km) for pixels within the PA	US Geological Survey Minerals Yearbook Volume III[5]	2015
River distance	Distance (km) to nearest coast	Average value of distance (km) for pixels within the PA	OpenStreetMap[6]	2020
Altitude	Altitude (meter) above sea level	Average value of altitude (m) for pixels within the PA	MadaClim	2014
Annual Precipitation	Cumulative amount of rainfall (ml) in a year	Total amount of rainfall (ml) summed over all pixels within the PA	MadaClim	2015
Slope	Slope (percent) of the terrain	Average value of slope (percent) for pixels within the PA	MadaClim	2016
PA characteristics	n.a.	Location and basic characteristics	World Database on Protected Areas[7]	continuously updated
Support for PAs	n.a.	Project support for PA	Project documents	2004, 2011

Note: n.a. = not applicable.

Forest Cover

The PPAR considers the project's effectiveness in biodiversity conservation as the effectiveness in the avoidance of deforestation. The latter is proxied by the (negative) change in deforestation rates over time. We calculated deforestation rates using the data set on forest cover available for Madagascar from Vieilledent et al. (2018). This pixel data at the 30-meter resolution and indicates whether the pixel is covered with forest (yes/no) in the years 1953, 1973, 1990, 2000, 2005, 2010, 2015, and 2017.

We first constructed a forest-cover data set that mapped the forest-cover data for each year to the layer of surface pixels. As the resolution of the forest-cover data are 30 meters, each surface pixel contains 1,111 (lower-resolution) pixels with information on forest cover. Thus, for each surface pixel, the share of forest cover was calculated, that is, the relative number of pixels within the 1,111 pixels that were classified by Vieilledent et al. (2018) as forest in the respective year. The forest cover share can range from 0 to 100 percent if the surface pixel contains no trees or is completely covered with trees, respectively.

Before calculating deforestation rates, the forest cover data was first used to retain the subset of surface pixels covering the forested land surface within and (50km) around PAs in Madagascar for the years 1953, 1990, or 2015. We retained all surface pixel for which at least one-third of the pixel was covered with forest at any given point in those three years. Thus, these forest pixels do not necessarily present "full" forests today, but, for example, also surface pixel pixels for which half of the surface was covered with forest in 1953 (and might be completely deforested in 2015). The results are robust to increasing the threshold to two-thirds.

Figure D.3 in appendix D shows the change in forest cover between 1953 and 2017 (left), 1953 and 1990 (middle), and 1990 and 2017 (right). These maps are for Madagascar as a whole, based on the 30m-resolution pixels of Vieilledent et al. (2018), not the subset of forest pixels. For each comparison, there are four classes of pixels (with the 1953—2017 comparison as an example): pixels considered as deforested (covered with forest in 1953 but not in 2017), reforested (covered with forest in 2017 but not in 1953), forest (covered with forest in both 1953 and 2017) and no forest (never covered with forest). In 1953, Madagascar had 16 million hectares of forest, which declined to 8.4 million hectares of forest in 2017. This is a reduction of 47 percent. The size of forests (9.7 million hectares) that is lost from deforestation between 1953 and 2017 is larger than the size of the remaining forests in 2017. If we compare the number of pixels that were considered as forest in 1953 and remained forest in 2017 (that is, "untouched" forest), we see a drop of 61 percent.

Deforestation

Based on the layer of forest-cover share, we calculated the annual rate of deforestation in the squared kilometer pixels following the methodology of Vieilledent et al. (2018):

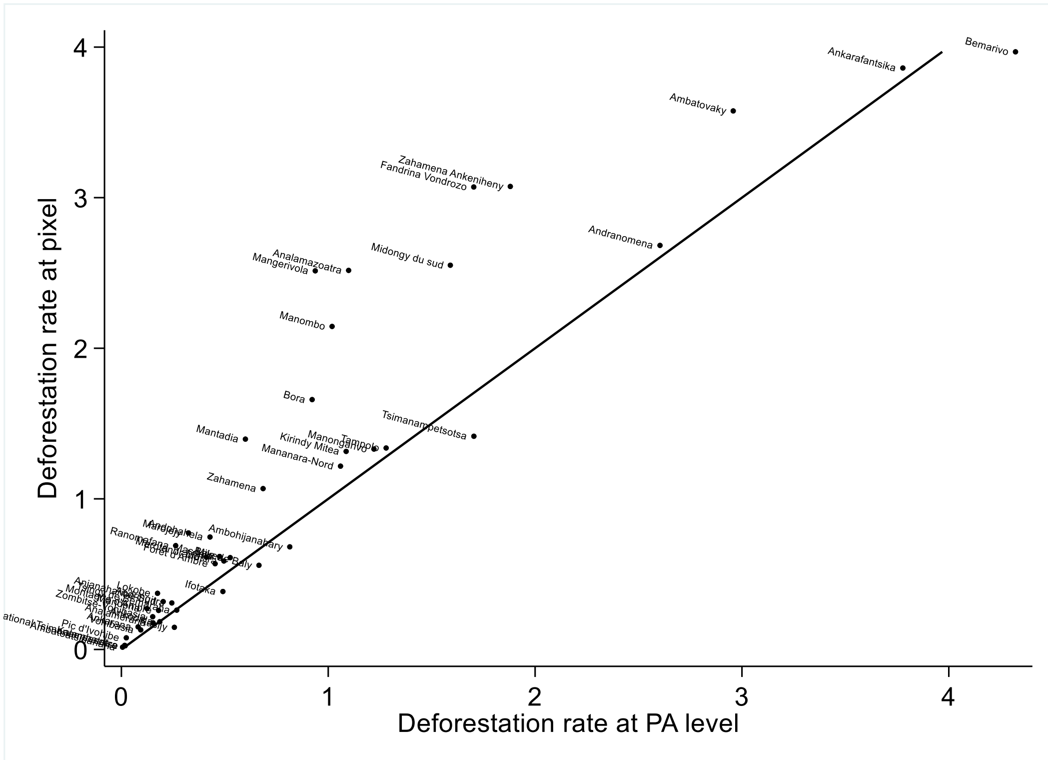
$$\theta = 100 * [1 - (1 - \frac{F_{t2} - F_{t1}}{F_{t1}})^{\frac{1}{t_2 - t_1}}] \qquad 2$$

Where:

- θ is the annual deforestation rate in percentage per year at the pixel level
- F_{t2} *and* F_{t1} are the forest cover at the pixel level free of clouds at date t_2 *and* t_1, respectively
- $t_2 - t_1$ is the time interval between the two dates in years

Equation 2 measures deforestation rates at the pixel level, which are then aggregated to the PA level. Thus, the deforestation rate in a PA for a given year is the average value of deforestation rates measured at the pixel levels (within the PA). Alternatively, we can aggregate the forest cover data at the PA level and calculate deforestation rates at the PA level using equation 2. The average value of the deforestation rate of a PA (aggregated from the pixel-level rates) does not always equate to the value of deforestation rates calculated at the PA level using average forest cover data (aggregated from the pixel-level rates). Figure C.1 shows the correlation between deforestation rates measured at the pixel level (y-axis) and PA level (x-axis). In most cases, the deforestation rate of a PA measured at pixel level is larger than the rate measured at PA level.

Figure C.1. Correlation between Deforestation Rates of PAs Measured at the Pixel Level and the PA Level for the Analytical Sample



Source: Forest cover data come from Vieilledent et al. 2018.
Note: The level of deforestation rates measured at the pixel level (y-axis) is plotted against the calculated values deforestation rates at the PA level using aggregated pixel values. PA = protected area.

This difference has to do with the fact that deforestation rates are calculated using the relative difference in forest cover and the average of a ratio is not necessarily the same as the ratio of an average (a problem commonly known as Simpson's paradox). This problem is aggravated by the fact that the relative value of an absolute change depends on the value of the denominator. Take the example of a PA that consists of two pixels where both pixels lose 0.1 forest cover between 2015 and 2017. The first pixel had 0.5 forest cover in 2015 and the second 0.1 forest cover. Although the first pixel saw a 20 percent decrease in forest cover, the second one experienced a 100 percent decrease. The arithmetic average of those two values will be 60 percent over the two years. However, if we would first aggregate the forest cover data at pixel data, the change in forest cover at the PA level is from 0.6 to 0.4. Hence, the change in forest cover would be 33 percent. Because in reality PAs consist of between 100 and 1,000 pixels, this problem can be substantial but difficult to assess.

Table C.2 reports the average annual deforestation rates (θ) for different periods. The averages are for all forest pixels combined and no comparison between PAs is made. For completeness, we also report the deforestation rate for Madagascar as a whole reported in Vieilledent et al. (2018). Table C2 shows that average annual deforestation rates have been decreasing from 1953—1990. Afterward, from 1990—2005, deforestation rates have started to increase slightly. Increasing deforestation rates have been documented in the literature using similar georeferenced data on land cover (using different canopy densities; for example, Waeber et al. 2016). Alarmingly, the annual deforestation rates are the highest in the last two years for which data are available (2015–17). The level and trends in the deforestation data are similar to what has been reported in the literature using alternative data sources.

Table C.2. Average Annual Deforestation Rates in Madagascar for Different Periods

Time period	Deforestation rates for Madagascar as a whole	Rates for forest pixels retained	Share of pixels with positive deforestation	Nonzero rates for forest pixels	Rates for forest pixels in PAs
Column	1	2	2a	2b	3
Source	Vieilledent et al. (2018)	IEG	IEG	IEG	IEG
1953–1973	0.6	0.5	43	0.7	0.2
1973–1990	1.6	1.7	77	2.0	0.7
1990–2000	0.8	1.0	47	1.5	0.5
2000–05	0.4	0.5	38	1.2	0.4
2005–10	0.7	0.8	43	1.6	0.5
2010–15	1.1	1.3	51	2.2	0.8
2015–17	—	2.5	40	5.2	1.7

Source: Independent Evaluation Group.
Note: Deforestation rates calculated by Vieilledent et al. (2018) for (column 1 and by the Independent Evaluation Group for columns 2 and 3 and each use a different sample of pixels. Although these rates cannot be directly compared, the columns show a similar trend of increasing deforestation rates during the project's timeline (between 2005 and 2013). Column 2a reports the share of pixels that saw a nonzero (positive) rate of deforestation. As this share is below 50 percent for most periods, the majority of forest pixels did not face deforestation. This could be because the forest pixel was already deforested in an earlier period. Therefore, the nonnegative deforestation rates in column 2b are higher than the deforestation rates in the other. Column 3 reports deforestation rates for pixels located in all protected areas in Madagascar. — = not available.

Table C.3 shows the long-term change in deforestation rates ($\Delta\theta$) for all PAs retained and differentiated by EP3 support. For completeness, and as an illustration, the table shows weighted and unweighted averages as well as changes measured as aggregated pixel data and calculated at the PA level. In the analysis, we use the values reported in the fourth column, that is, the weighted values of changes in deforestation rates, where the latter were aggregated at the PA level. This is because the deforestation rates used to construct this measure are in line with those reported in the academic literature (Vieilledent et al. 2018; Waeber et al. 2016). Although the value of the long-term change in deforestation rates depends on the construction method, the differences in changes between project PAs and those without support are not significant. Hence, table C.3 concludes that the PAs supported under the EP3 have not seen different changes in their deforestation rates than their counterfactual.

Table C.3. Average Change in Annual Deforestation Rates in Madagascar for Different Periods

Long-Term Change Deforestation Rates			Aggregated at the PA Level		Calculated at the PA Level	
Sample	**n**	**Weight**	**Weighted**	**Unweighted**	**Weighted**	**Unweighted**
1. All PAs in Madagascar	110	52,094	1.4	0.92	1.04	0.83
2. Subsample for analysis	45	33,430	1.28	0.92	0.83	0.67
2a. project PA	22	25,900	1.41	1.02	0.85	0.65
2b. nonproject PA	23	7,530	0.83	0.82	0.73	0.68
Difference 2a−2b significant?			no	no	no	no

Source: Independent Evaluation Group.
Note: The table reports changes in deforestation rates. “Sample” refers to the sample of protected areas (PAs) on which the changes are calculated; “n” is the number of observations, that is, terrestrial PAs in the PA data set (consulted in 2020); and “weight” refers to the number of pixels within each sample. Columns 4 and 5 report deforestation rates calculated at the pixel level and aggregated at the PA level (by taking the average). Columns 6 and 7 report deforestation rates calculated at the PA level. In these columns, “weighted” refers to summary statistics weighted by the number of pixels in each PA, and “unweighted” are the unweighted statistics. The last row indicates whether the deforestation rates are different between project and nonproject PAs. EP3 = Third Environment Program Support Project.

Protected Areas

The World Database on Protected Areas provides data on the location and basic characteristics of PAs. The list of PAs in Madagascar is matched with the PAs that have received support from the EP3 (through the GEF or IDA funding) as documented in the supporting documents of the PAD or AF. Based on this information, each forest pixel is classified according to the (potential) support it received: forest pixels located in project PAs, forest pixels located in PAs not supported by the EP3 (but potentially through other organizations), and forest pixels that did not receive any protection status (because they are outside PAs). The latter group of forest pixels is a very diverse group, including the buffer zones of PAs where the World Bank also implemented community-based forest management activities. The granular geographic location of where the World Bank implemented community activities is, however, not known.

The different classes of forest pixels are presented in figure D.4 in appendix D with the three colored areas overlaying the forest pixels. The yellow areas represent nonproject PAs, the red areas represent project PAs since the start of EP3, and the blue areas represent PAs supported by the EP3 after the AF. The green dots within these areas represent forest pixels. The remaining green dots (not in one of the three areas) represent forest pixels that did not receive protection under the PA system.

Forest Fires

Deforestation is often linked with the unsustainable management of forest resources by households in local communities surrounding forests that rely on forest resources for their livelihoods. In Madagascar, *tavy* and slash-and-burn activities to clear forest for agricultural land are considered the most important drivers of deforestation. To capture the effect of shifting agricultural cultivation activities, we hypothesize that areas where slash-and-burn activities are actively practiced coincide with the areas that have experienced a (larger) increase in the incidence of human-induced forest fires. Of course, there could be many causes behind human-induced forest fires, but we assume that fires are mostly a means for the clearing of land for agricultural purposes. The change in forest fires over time will (partly) control for the naturally-occurring forest fires, and capture human-induced increases in forest fire.

We use data on the number of forest fires that occurred in a forest pixel in 2001, 2005, 2010, and 2015 from the NASA Fire Information for Resource Management System. Figure D.5 in appendix D presents the number of forest fires (zero, one, two, and more) for 2001 (left), 2015 (middle), and the change over time.

Agricultural Yields

To capture the link between forest fires and agricultural productivity, we hypothesize that decreasing soil fertility levels increases the need for shifting agricultural cultivation activities. The latter can be to maintain the food security of local communities or to respond to market-driven opportunities. The change in soil fertility over time is proxied by the change in rice yields during the project's timeline. The data on yields (ton/ha) in 2000 and 2010 comes from the Spatial Production Allocation Model of the International Food Policy Research Institute (You et al. 2014) with the caveat that 2010 is the latest year with data available. It is hypothesized that a decrease in rice yields during the project's timeline would stimulate tavy activities to clear new pockets of fertile land. Figure D.6 in appendix D shows the change in rice yields over time.

Although rice is assumed to be the crop for food subsistence, forests are also cleared for the opportunistic cultivation of cash crops. The latter include the traditional export crops such as vanilla as well as higher-value staple crops such as maize. Contrary to received wisdom, environmental degradation is not driven purely by food security needs but by a wide range of factors including cash cropping by wealthy rural households using vulnerable peoples in societies (such as migrant laborers) and uncontrolled fires from pasture burning (Minten and Méral in 2006; Scales 2014; Vieilledent et al. 2020).

To proxy for commercially-orientated behavior in agricultural production, the Spatial Production Allocation Model data are also collected for maize yield (change). Table C4 provides the summary statistics on the mean and median of agricultural yields of maize and rice in 2000 and 2010. We also measure the change in yields over time and test whether this change is significantly different from zero.

Table C.4. Level and Change in Agricultural Yields on Land Outside PAs Considered in the PPAR

Agricultural yield	mean	Significantly different from zero?	p50	Significantly different from zero?
Rice yield in 2000 (kg/ha)	1,556		1,682	
Rice yield in 2010 (kg/ha)	1,529		1,253	
Change in rice yield (percent)	−19	**	−16	no
Maize yield in 2000 (kg/ha)	617		605	
Maize yield in 2010 (kg/ha)	1,197		945	
Change in maize yield (percent)	89	***	8.3	no

Source: Independent Evaluation Group.
Note: the 'mean' and 'p50' column reports the value of the sample average and median of rice and maize yields (in kg/ha) of PAs in the respective years. The third and sixth row report the change in rice and maize yield over time, respectively. These changes (in percentage) are the average of the PA-individual change in crop yields, and hence are not just the ratio of the numbers reported in the two columns above. The 'significantly different from zero' columns report the result of a simple t-test whether the change in yield is estimated to be significantly different from zero. *, **, or *** refer to the level of statistical significance for which the difference is significant. no means that the difference is not significantly different from zero.

Land Cover and Use

Slash-and-burn activities are incremental changes in land use driven by declines in soil fertility. Larger changes in land use (that is, clearance of pockets of forest) are expected in other parts of the forest. The clearance of large pockets of forest for agricultural activities is especially driven by people who migrated from outside the community, often driven by climatological changes. We try to capture larger clearances of the forest by looking at the change in land cover before and after the project. Data on land cover come from the Land Cover Type Product derived from the Moderate Resolution Imaging Spectroradiometer.[8] Although all drivers of deforestation result in changes in land cover, once we control for other drivers, we assume that the change in land cover captures larger clearances of the land. This remains, however, an imperfect proxy, and unfortunately, we are unable to control for large-scale logging activities.

Population Pressure

Forests are not only cut to access soils, the trees and other resources in the forest are also exploited. For example, the dominant source of household energy for 95 percent of Malay households is woody biomass (World Bank 2015). To capture the effect of unsustainable (or illegal) extraction of forest resources by nearby communities, we measure changes in population density between 2000 and 2015. The number of people per pixel comes from the Global Rural-Urban Mapping Project, Version 1 (GRUMPv1). The hypothesis is that increased population pressure will increase the likely need of communities to (illegal) use forest resources. It is important to note, however, that population pressure is less an issue for humid forests on the east coast compared with dry forests in the south-western part of Madagascar.

Locational Drivers of Deforestation

Locational aspects of the forest determine its accessibility in the landscape and the potential of the forest soil for agricultural production. Locational aspects, which include both the geographical location and agroecological status of PA, thus condition the likelihood that humans can use the forest for their livelihoods. Accessible forests are more easily entered by people from within and outside the community, but these forests should also be relatively easier to patrol. Hence, the remoteness of the forest pixel to the nearest town can have an ambiguous effect on deforestation. Remoteness is measured by the travel time (hours) in 2015 to the nearest town of 50,000 inhabitants using the road network. These data come from Weiss et al. (2018).

We further include the straight-line distance (km) from the forest to the nearest coast, mine, and river. It is believed that coastal communities practice more shifting cultivation activities. Hence, forests closer to the coast might face a higher likelihood to be threatened by slash-and-burn activities. Access to rivers ease the transportation of logged trees. Similarly, forests closer to mines are more likely to see localized clearances of trees for mining (or other economic) and subsistence (fuel and construction) activities. These distances were calculated based using data from the “global Administrative area” data base, U.S. Geological Survey Minerals Yearbook, and OpenStreetMap database in Madagascar, respectively. More details on the data sources are provided in table C.2.

Finally, deforestation rates are determined by the location of the forest in the landscape. It is hypothesized that forests located at higher altitudes or on terrain and steeper slopes are less likely to be deforested, as they are less suitable for agricultural production, whereas lowlands hills with southerly aspects are often good for the cultivation of crops. We further control for annual precipitation and the number of dry days to account for agroecological factors. All of these environmental and climatological data are provided by the MadaClim website.[9]

Household-Level Data

Poudyal et al. (2018b) implemented a series of field surveys between July 2014 and November 2015 to study the costs and benefits from the creation of the new PAs in the forest corridor of CAZ. The authors randomly-selected households located in five purposely-selected sites in the vicinity of the new protected area. Among these five study sites, two were located adjacent to CAZ, two were next to adjacent long-established PAs and one site was away from the forest frontier. In the first phase, Poudyal et al. (2018b) surveyed 603 households on their demographic and socioeconomic characteristics. These households also participated in a choice experiment to elicit their opportunity cost of conservation. The second phase revisited a subset of 171 households to collect information on their agricultural input and output behavior. Combined, the surveys provide detailed information on land use, agricultural practices, and income sources.

Of the two sites surveyed in the vicinity of CAZ, one site received safeguard activities (Ampahitra) but the other not (Sahavazina). This variation allows to compare households in the two villages to capture the effect of safeguard implementation. We do so by estimating the effect of safeguard implementation (at the village level) on household agricultural outcomes in a regression framework. To account for confounding factors, we include land size, access to an irrigated rice plot and, the number of household (labor) members in the regression to control for indirect effects of safeguards (for example, capturing by larger households). The latter variables should also control for systematic differences between agricultural practices in the two villages (if any). We further include the age, gender, literacy rate, and years of education in the regression to control for human capital effects of the respondent. Thus, we run the following regression:

$$y = \alpha + \beta * safeguards + controls + \varepsilon \qquad 3$$

We further use the household-level data to get a better insight into the farm and other realities of households that live in and around PAs. Of particular interest are the following questions. First, the survey asks for the type of each plot (of the total of 721 plots) and responses were recorded as hill tavy, flat tavy, tanimbary, tanimboly, savoka, or other. Second, the ownership status of these plots was incurred and responses were recorded as inherited, rented, bought, borrowed, cleared by the household, or other. Third, the survey asked what factors farmers consider limiting to the productivity on their tavy land, with possible responses being labor availability, access to fertilizer, access to seed, fertility of existing land, pests (mice, insects, birds), weeds, or rainfall. The responses from these questions are presented in a series of bar charts in figure D.7 in appendix D.

Qualitative Interviews

The evaluation team discussed the quantitative findings with different key World Bank staff, government officials, researchers, and stakeholders involved in the project or currently active in environmental policy making. Because of COVID-19 related travel restrictions, interviews were conducted virtually. Respondents involved or familiar with the project were asked about background information on the country and sector, personal experiences and impressions, and lessons learned from the project. These respondents were also asked to interpret the main findings of the quantitative analysis. Respondents not directly involved in the project were asked about the current state of environmental policy making in Madagascar and research available on the sector and country.

Table C.5. People Interviewed

Person Interviewed	Current Function	Function in Project
World Bank		
Giovanni Ruta	Senior Environmental Economist	TTL AF
Erik Reed	Natural Resources Management Specialist	TTL SLMP
Christophe Crepin	Practice Manager SSAEN	TTL design
Martien Van Nieuwenkoop	Global Director SAGDR	TTL design
Paul-Jean Feno	Senior Environmental Specialist	Environmental Specialist
Non-World Bank		
Julia Jones	Professor in Conservation Science at Bangor University	
Sarobidy Rakotonarivo	Postdoctoral researcher École Supérieure des Sciences Agronomiques, Université dAntananarivo	
Nanie Ratsifandrihamanana	Country Director WWF Madagascar	
Mark Freudenberg	Senior Associate Tetratech, USAID	
Mamy Rakotoarijaona	Director-general MNP	
Claudia Eckhardt	Senior Environmental and Social Expert KfW Development Bank	
Sebastien Cognet	KfW Development Bank	
Lisa Gaylord	Global Coodinator, Livelihoods and Landscapes Strategic Platform Catholic Relief Services	USAID
Alain Liva Raharijaona	Executive Director FPBM	
Jean Chrysostome Rakotoary	Coordinator New Deal, WWF Madagascar	

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Notes

[1] Source Hotspot / Active Fire Detections MCD14DL (database), Fire Information for Resource Management System (FIRMS) (https://earthdata.nasa.gov/firms), part of NASA's Earth Observing System Data and Information System (EOSDIS). (accessed May 18, 2020]. The most recent (and detailed) source is the active fire product derived from the Visible Infrared Imaging Radiometer Suite (VIIRS), but it only provides data from 2012 onward.

[2] Source: Spatial Production Allocation Model (SPAM) 2005 v2.0, You, L., U. Wood-Sichra, S. Fritz, Z. Guo, L. See, and J. Koo. (2014), (accessed April 30, 2020), https://mapspam.info.

[3] Source: Global Rural-Urban Mapping Project, 2006. Center for International Earth Science Information Network–CIESIN–Columbia University, International Food Policy Research

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[4] Source: Global Administrative Area Database (Version 2.8), 2018, (accessed April 30, 2020), https://gadm.org/index.html.

[5] Source: US Geological Survey, 2015, Area Reports—International: US Geological Survey Minerals Yearbook, v. III. Washington, DC: US Geological Survey, (accessed April 30, 2020), https://doi.org/10.3133/mybvIII.

[6] Source: OpenStreetMap, Waterway network, 2020, (accessed April 30, 2020), https://export.hotosm.org/en/v3/.

[7] Source: Protected Planet: The World Database on Protected Areas (WDPA)/OECM Database, UNEP-WCMC and IUCN, Cambridge, UK, (accessed April 30, 2020), www.protectedplanet.net.

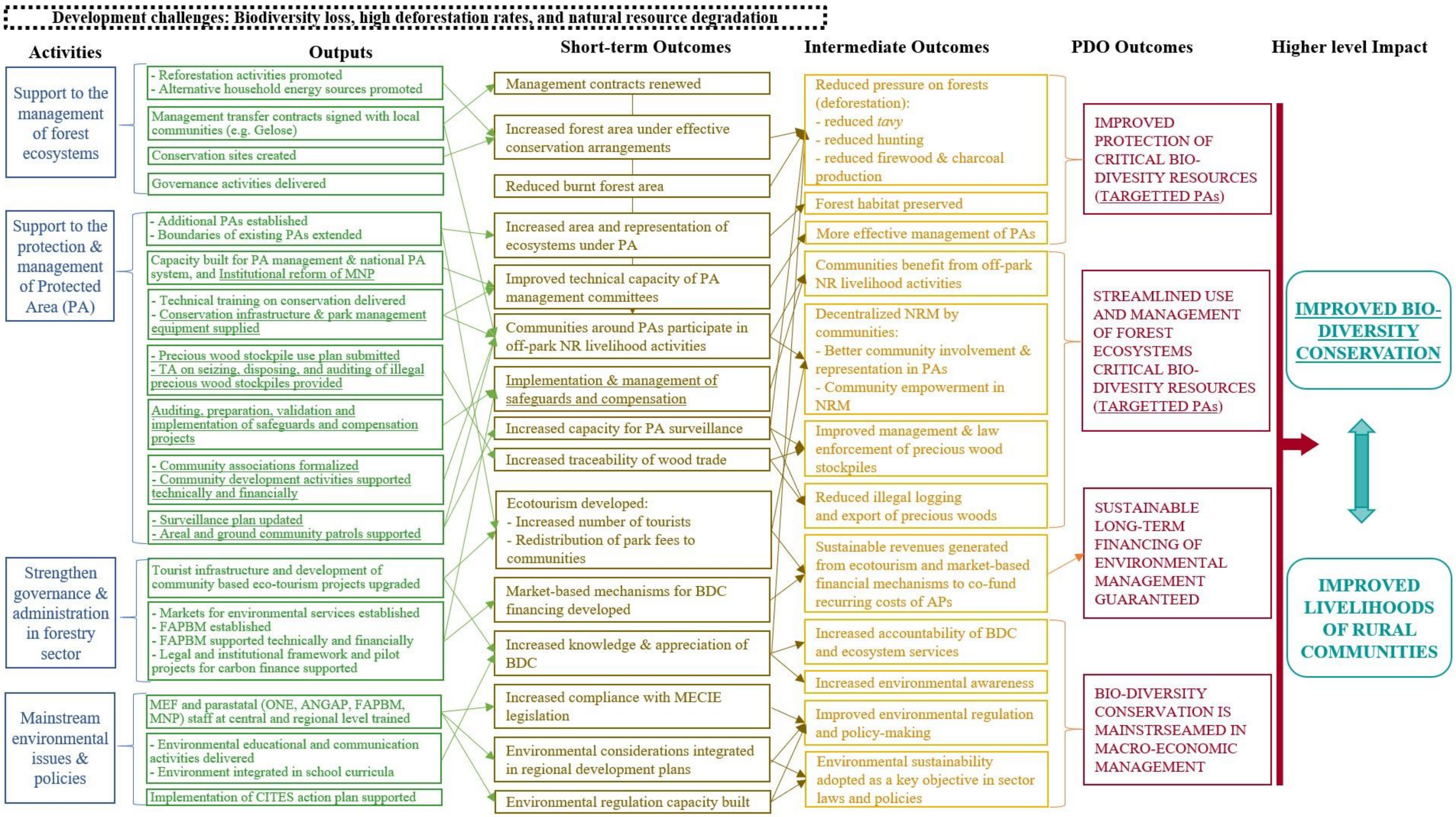
[8] We grouped land cover as (i) any forest, (ii) any shrubland and savanna, (iii) grassland, and (iv) cropland. The gradual sequence of deforestation is the conversion from (i) to (ii), (ii) to (iii), and (iii) to (iv). However, (i) can be directly converted to (iii) and/or (iv).

[9] The MadaClim data come from MadaClim: Free climate and environmental data for Madagascar, Centre de coopération internationale en recherche agronomique pour le développement (CIRAD), Montpellier, France (accessed April 30, 20200, https://madaclim.cirad.fr/. The MadaClim data provide processed climatological and environmental data for Madagascar readily to use from climate-data portals such as the WorldClim and the Consultative Group for International Agricultural Research' program on Climate Change, Agriculture and Food Security.

Appendix D. Additional Data

This appendix provides additional information, tables, and figures that are used to substantiate some of the main findings reported in the Project Performance Assessment Report. Figure D.1 provides the complete ToC based on project activities and expected outputs and outcomes from both the original and revised project design. This ToC illustrates the comprehensiveness and complexity of the initial design. Figure D2 provides an overview of a selected literature review on the local drivers of deforestation in Madagascar. The short discussion on the location, actors and impact of different drivers of deforestation provides the important conclusion that, besides the primary driver of shifting cultivation mostly discussed in the main text, many primary and secondary drivers are at play. Moreover, these drivers are interconnected and interdependent. Figures D.3–D.6 provide a visualization of the different geospatial data used in the analysis of the PPAR (and discussed in appendix C). It illustrates how the forest cover, forest fire frequency, or rice yields have changed over time in Madagascar. Finally, figure D.7 provides descriptive statistics of important characteristics of farming practices in several villages surrounding one of the new PAs. These data come from households surveyed by Poudyal et al. (2018b) and provide qualitative insights in the type and ownership of plots, the level of agricultural incomes, and the most important constraints to productivity improvements for communities living in the forest frontier.

Figure D.1. Complete Theory of Change of the EP3 at Initial Design Stage



Note: ANGAP = National Agency for Protected Areas Management; BDC = Biodiversity conservation; CITES = Convention on the International Trade in Endangered Species of Wild Fauna and Flora; FAPBM = Madagascar Foundation for Protected Areas and Biodiversity; GELOSE = Locally secured management; MEF = Ministry of Environment and Forests; MNP = Madagascar National Parks;. NRM = Natural Resource Management; PAs = Protected Areas; ONE = National Environment Office.

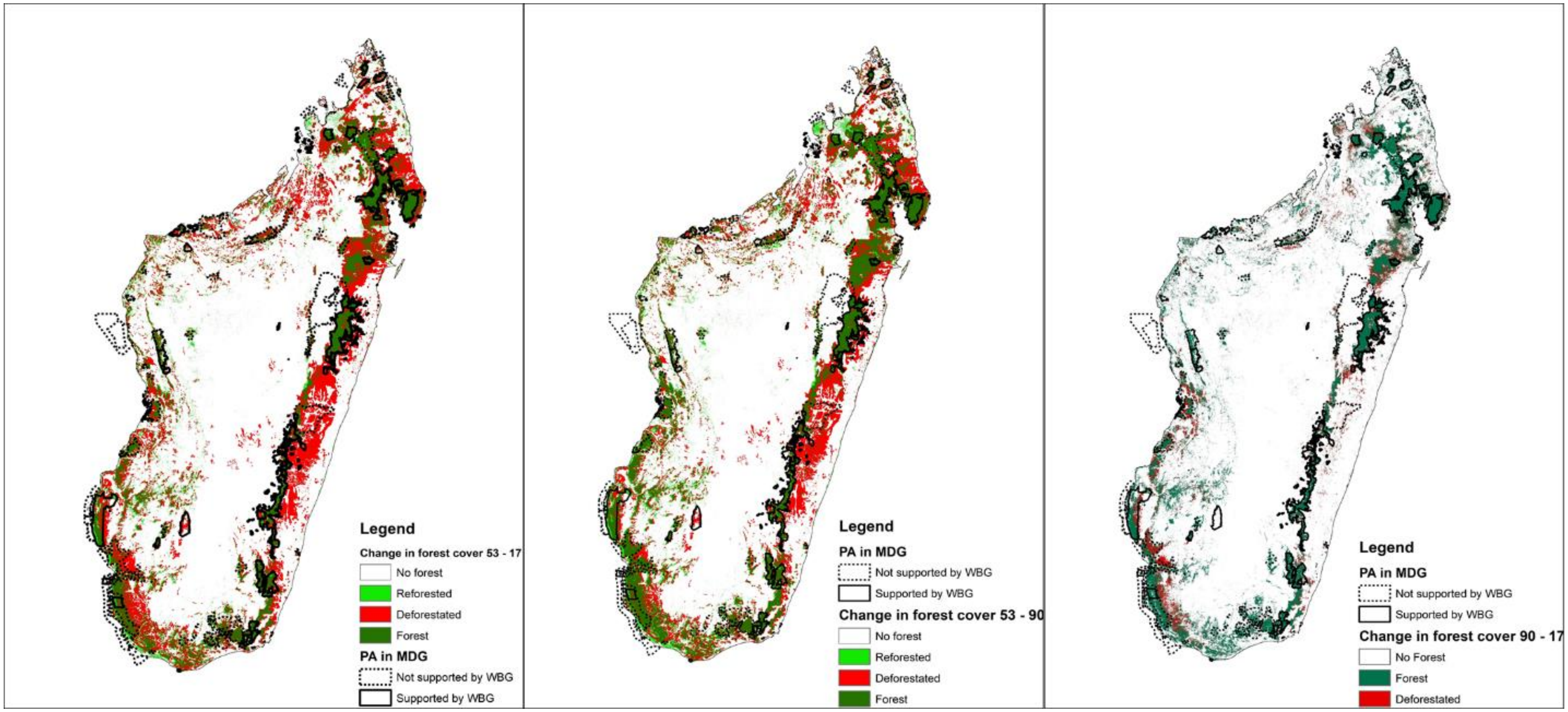
Figure D.2. Drivers of Deforestation in Madagascar

No.	Driver	Where?	Who?	Hypothesized Impact	Main Cause	Link with other drivers
				Primary deforestation drivers		
1	Shifting cultivation (*tavy* and *tevy-ala*) for food subsistence	Rice, manioc, and sweet potato production in the humid east; Maize production often in the west and south (also called *hatsake*).	Smallholder farmers on hillsides around forests.	*Tevy-ala* is the process of converting primary forest into agricultural lands for subsistence crops by clearing, drying, and burning the forest. *Tavy* is slash-and-burn cultivation on existing agricultural land after fallow that reduce soil fertility and can unintentionally affect forests through fires.	a, b, c, e, h, l	2: cash from high-value crops is invested into forest clearances for staple crops; 3: firewood collection opens forest that is later cleared for agricultural purpose.
2	Permanent and opportunistic cash crop cultivation for markets	Maize and peanuts in the south and west; Vanilla, cloves, and coffee in the humid east; Sisal production on former colonial plantation.	Local elite own plantations but cultivated by migrants.	Cash crop production is a more intensive land use, but it generates cash income that, without outside investment opportunities, can be reinvested in land clearing for food production.	d, e, g, i, k	4: logging is followed by land clearances for agricultural purposes as money from illegal logging can be invested into cash crops.
3	Firewood collection and charcoal production	west and south-west regions, especially an issue around cities.	Rural households, especially with traveling distances for urban demands for charcoal.	Firewood is sourced through the collecting of wood in forested areas. Charcoal is sourced from the wood of trees or bushes (often eucalyptus plantations in highlands). Sometimes areas have been burnt to provide initial access and this process can be combined with land clearances in natural forest areas for agriculture. 80–90 percent of household energy comes from firewood/charcoal.	e, h, j, k, l	
4	Rosewood logging	Eastern region, especially Marojejy, Makira, and Masoala PAs.	Local and urban elite.	Direct removal of rosewood and open up of forest for firewood and charcoal collection leading to agriculture in some fertile areas.	i, j, k	
				Secondary deforestation drivers		
5	Artisanal mining	Across the country but often in PAs (gold and precious stones).	Rural and urban people turn to mining in a hope of	Gold and sapphire mining open up forested areas. Most often, families search for gold combined with their agricultural activities in specific areas across the	g, j, k	

No.	Driver	Where?	Who?	Hypothesized Impact	Main Cause	Link with other drivers
			finding precious stones to make money.	country. Only those who succeed will become fulltime miners.		
6	Livestock rearing	Particularly near fragmented, isolated and/or narrow forest corridors.	Pastoral communities.	Grassland/bush burning for grazing areas and can catch forest edges especially fragmented forests.	c, e	
7	Hunting	Across the country.	Rural households.	Direct removal of forest and nonforest resources.	h, k, l	

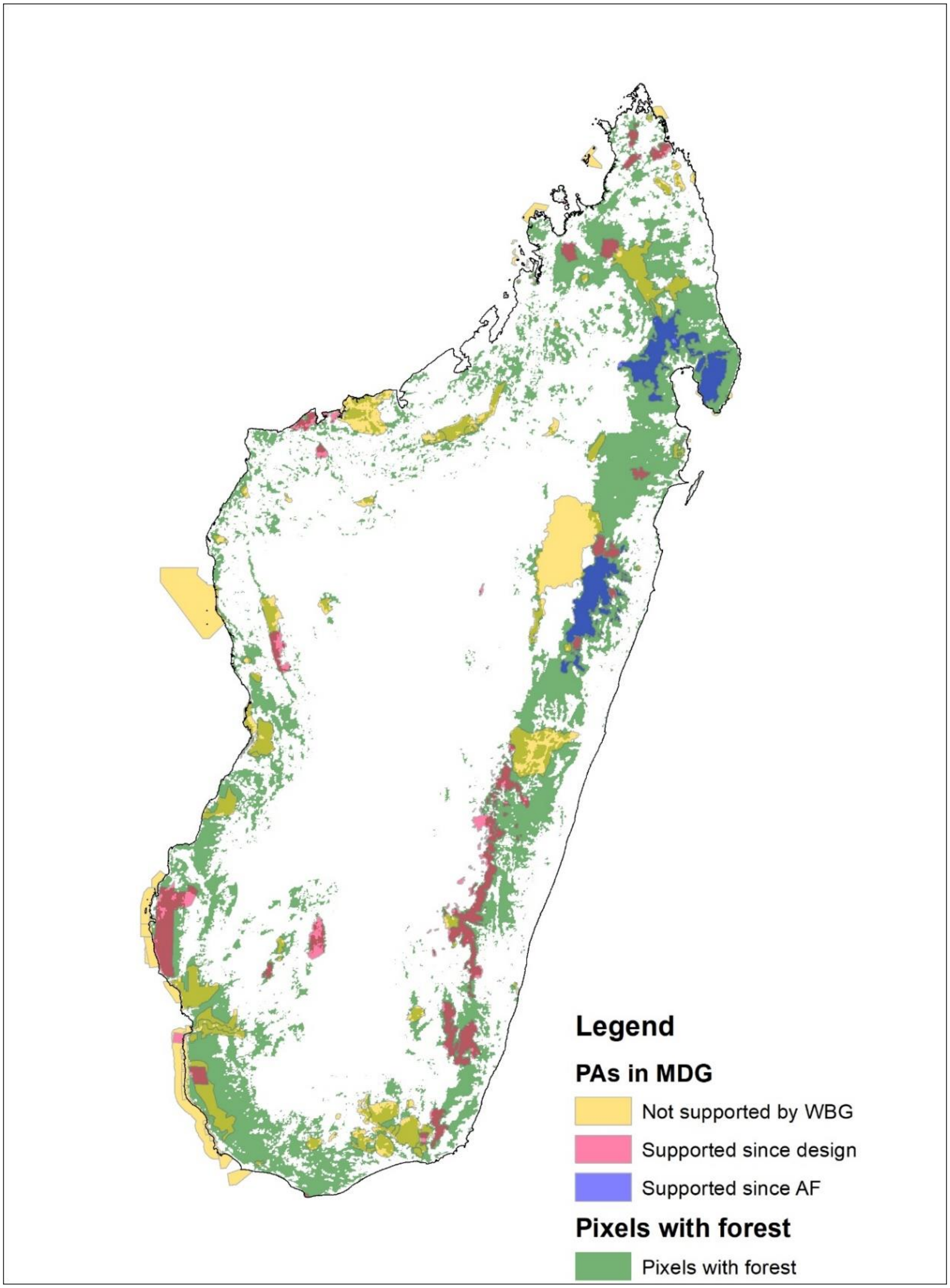
Sources: Main sources of this table are Desbureaux and Damania 2018, Desbureaux et. Al 2015, Harvey et al. 2018, Healy 2018, Scales 2014, Tabor et al. 2017, and World Bank 2013.
Note: Main causes refer to (a) Declining soil fertility, (b) Reduction in fallow periods, (c) Tenure insecurity, (d) domination of community associations by local elites, (e) Local population pressure, (f) Lack of local investment opportunities, (g) Climate change induced migration, (h) Tradition and customs, (i) Political instability, (j) Remoteness, (k) Lack of regulation, (l) Impoverished livelihoods.

Figure D.3. Change in Forest Cover in Madagascar for Different Time Periods



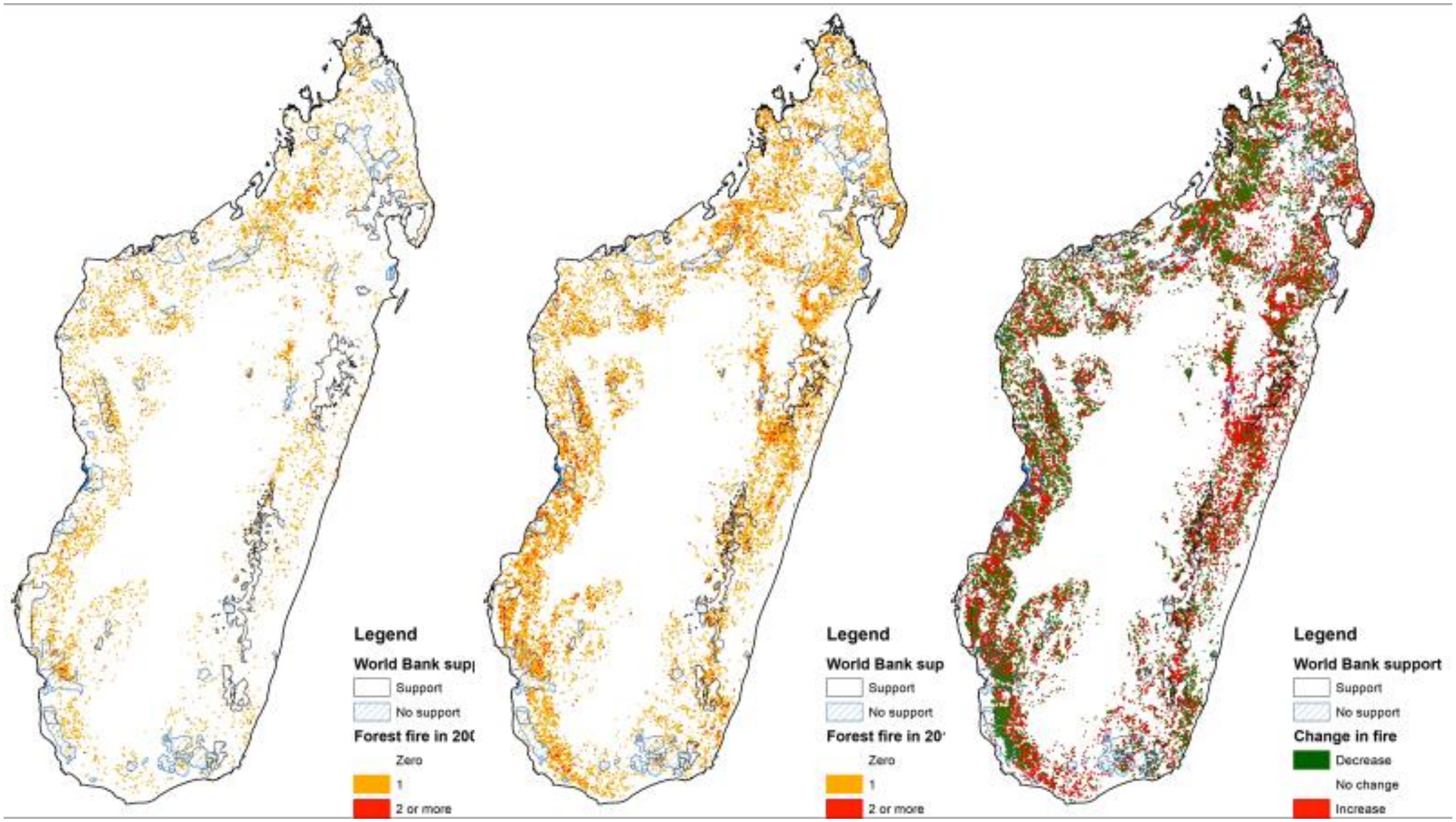
Source: Forest cover data from Vieilledent et al. (2018). (see Table C.1).
Note: change in forest cover between the periods 1953–2017 (left), which is then split up in the period 1953–1990 (middle, corresponding to the period before the National Environmental Action Program) and 1990–2017 (right, the period of the National Environmental Action Program and its three Environment Programs).

Figure D.4. The Graphical Location of the Forest Pixels and PAs



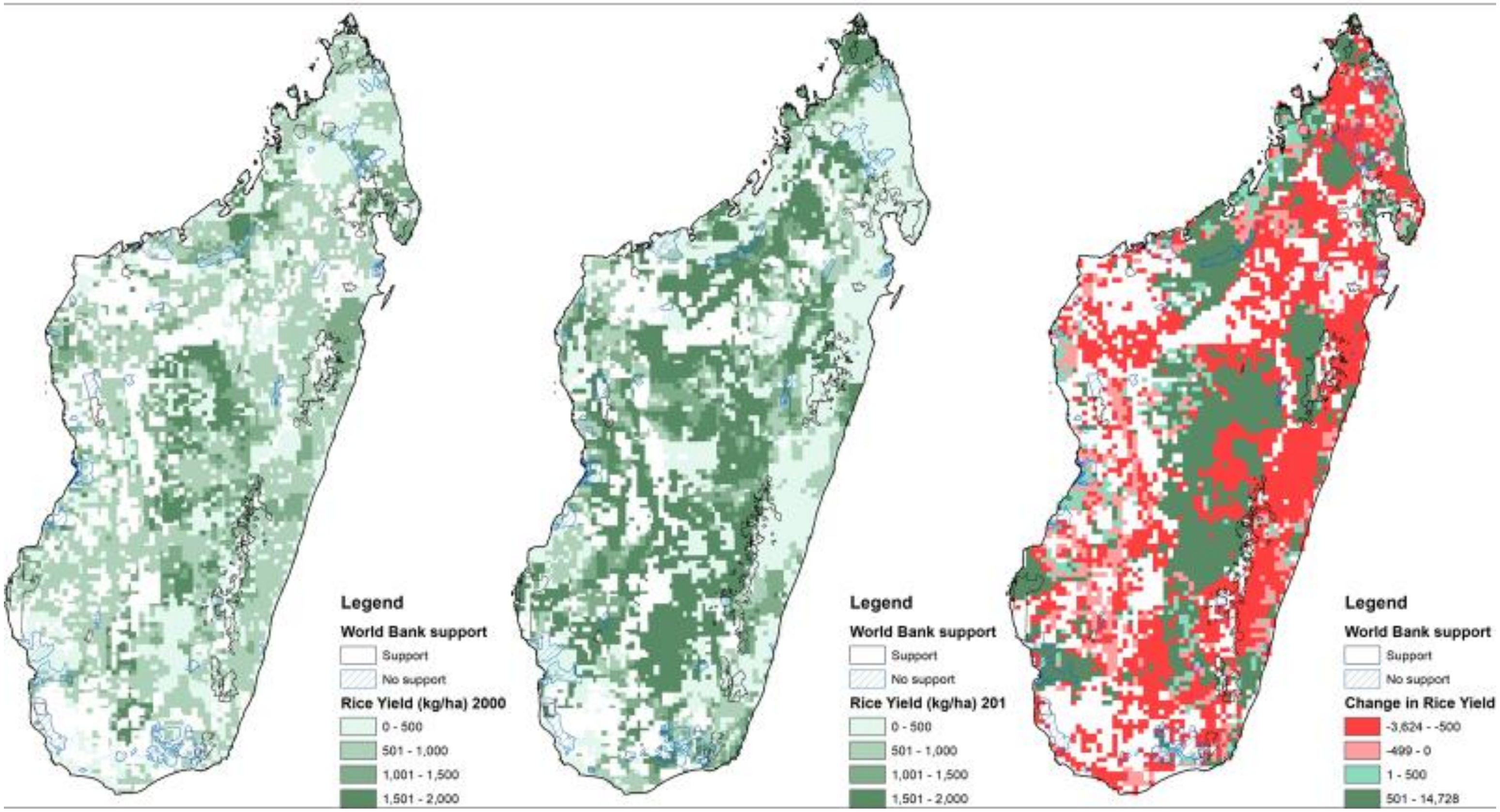
Source: Forest cover data from Vieilledent et al. (2018) and PA location from World Database on Protected Areas (see Table C.1).
Note: MDG = Madagascar; PA = protected area.

Figure D.5. Change in Forest Fire Frequency in Madagascar between 2001 and 2015



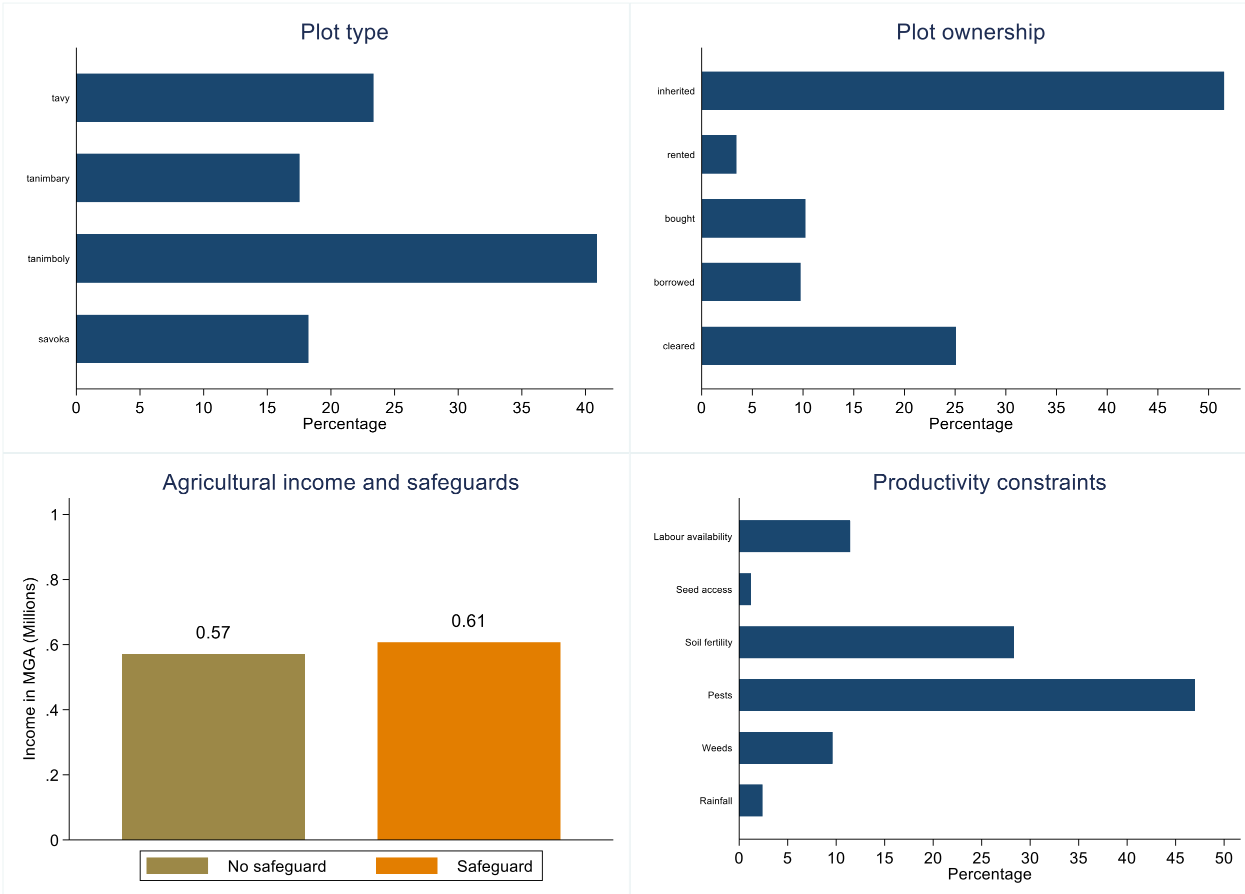
Source: Fire Information for Resource Management System from NASA (see Table C.1).
Note: The number of forest fires (zero, one, two or more) in forest pixels in 2001 (left), 2015 (middle), and the change over time. The areas contoured in black represent PAs that received support from the World Bank, and the areas contoured (and dashed) in blue represent PAs that did not receive support

Figure D.6. Change in Rice Yield in Madagascar between 2000 and 2010



Source: Spatial Production Allocation Model from You et al. (2014) (see Table C.1).
Note: Rice yield (kg per hectare) in forest pixels in 2000 (left), 2010 (middle), and the change over time. The areas contoured in black represent protected areas that received support from the World Bank, while the areas contoured (and dashed) in blue represent protected areas that did not receive support.

Figure D.7. Household-Level Data



Source: Poudyal et al. (2018).
Note: The data is collected from households in the Ankeniheny-Zahamena forest corridor. The four different variables presented in the figure are explained in appendix C.

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Appendix E. Borrower Comments

Government's Response to Madagascar Third Environment Program Support Project (P074235) Draft PPAR

April 6, 2021

1. To a large extent, the government's position complements the findings of the report. While the objective of expanding the area and number of protected areas, supported by PE3, was achieved, the failure to fully integrate the dynamics and needs of communities, led to underinvestment in these aspects and undermined the objectives of biodiversity conservation in the long term, which are too limited an objective in and of itself. The limitations in this approach lead to inadequate outcomes that are still felt by the country, and the country's protected areas to this day.

2. It is also worth noting that although the transition to a landscape approach may have limitations, such as not specifically targeting specific individuals involved in deforestation, it is an improvement. This is also a lesson that has been taken on board and prioritized by the current government through approaches such as landscape restoration, which not only focus on deforestation (or avoided deforestation) rates as the primary measurements of success, but also on land restoration and rehabilitation for multiple purposes. The Government has launched a broad scale reforestation effort across the country that goes far beyond just protected areas. This shift to more integrated and nuanced investments indeed requires more investment and coordination between donors and should indeed be fully inclusive of multiple stakeholders such as the private sector who must all work at a confluence for improvement of livelihoods and economic development as well as sustainable conservation. This more holistic approach should include stronger support for governance systems so that the government is an equally funded partner and able to ensure and facilitate the integration of multifaceted development goals.