Country Profile

# Madagascar

## Investing in Land Degradation Neutrality: Making the Case

### An Overview of Indicators and Assessments

THE GLOBAL MECHANISM
United Nations Convention to Combat Desertification

# Contents

# 1. Quick Facts

**In Madagascar, 1.9 million people were living on degrading agricultural land in 2010 – an increase of 27% in a decade, bringing the share of rural residents who inhabit degraded agricultural land up to 14% of the total rural population.** Land degradation can severely influence populations' livelihood by restricting people from vital ecosystem services (including food and water), increasing the risk of poverty.

**During the same time period (2000-2010), the amount of people residing in remote degrading agricultural areas with limited market access increased by 28%, reaching 366 thousand people.** Populations in remote areas have restricted options for managing land and accessing other benefits of economic development.

**The annual cost of land degradation in Madagascar is estimated at 1.7 billion United States dollars (USD). This is equal to 23% of the country's Gross Domestic Product**. Land degradation leads to reduction in the provision of ecosystem services that takes different forms – deterioration in food availability, soil fertility, carbon sequestration capacity, wood production, groundwater recharge, etc. – with significant social and economic costs to the country.

**The returns on taking action against land degradation are estimated at 4 USD for every dollar invested in restoring degraded land in Madagascar.** Assessments of the costs of action against land degradation through restoration and sustainable land management practices versus the cost of inaction highlight the strong economic incentive for bold actions against land degradation.

**In Madagascar, the Agriculture, Forestry and Other Land Use (AFOLU) sector is responsible for 89% of the total greenhouse gas emissions of the country. The removals of carbon emissions by forests are estimated at 15% of the total emissions of the country**. Due to the role of terrestrial ecosystems as a source and sink of emissions land is positioned as a key point of intervention for climate change mitigation and adaptation as reflected in Madagascar's Nationally Determined Contributions (NDC).

**Land-based mitigation options rank among the most cost-effective opportunities to sequester carbon emissions.** Economic evaluations of various climate change mitigation alternatives show that capturing carbon through restoring degraded lands (including degraded-forest) is a cost-effective option that offers multiple co-benefits.

**Sustainable Development Goal 15, 'Life on Land', and its target 15.3 on Land Degradation Neutrality (LDN) is a unique opportunity for countries to curb the growing threats of land degradation and to reap multiple socioeconomic benefits of LDN.** Madagascar has set a national voluntary LDN target, established an LDN baseline, and formulated associated measures to achieve LDN.

# 2. Population on Degrading Land

## 2.1 National Overview

Land is a source of well-being for present and future generations – it provides a wide range of ecosystem services that sustain human needs. Land degradation can severely influence livelihoods by limiting the availability of vital ecosystem services (including food and water), increasing the risk of poverty[1] and ultimately forcing people to migrate.[2]

A recent study[3] shows that the state of the land, whether it is improving or degrading, can to a large extent influence the impact of the country's economic growth on the alleviation of poverty, making land an accelerator (or decelerator) of poverty eradication.

In 2010, 14% of the rural population of the country was living on degrading agricultural land, which amounts to approximately 1.9 million people.[i] Moreover, between the years 2000 and 2010, the number of people living on degrading agricultural land grew by 408 thousand, representing an increase of 27% over the decade (see table 1 for further details).

By 2010, 366 thousand people or 3% of Madagascar's rural population resided in remote[ii] degrading agricultural areas without market access. This number increased by 28% between 2000 and 2010 (see table 1). Populations in remote areas have more limited options for managing land and accessing other benefits of economic development.[2]

Moreover, 75% of people employed in Madagascar are linked to the agriculture sector.[4] The intensification and expansion of land degradation may severely affect labor productivity, ultimately jeopardizing agricultural livelihoods in the country.

Improving land quality and living standards of the rural population requires policy responses that improve the condition of terrestrial ecosystems by avoiding, reducing and reversing degraded land. Investments, particularly in hotspot locations characterized by both high restoration potential and high socioeconomic benefits in poverty areas, will improve the conditions of the most vulnerable people and increase the resilience of ecosystems.

**Table 1: Population on degrading agricultural land in Madagascar**[3,4,5]

| Population categories[i] | 2000 | 2010 | % change from 2000 to 2010 |
|---|---|---|---|
| Rural population on degrading agricultural land | 1,527,279 | 1,935,328 | 26.7% |
| Share (%) of rural population on degrading agricultural land | 13.3% | 13.5% | *0.2% |
| Rural population on remote degrading agricultural land | 285,434 | 365,753 | 28.1% |
| Share (%) of rural population on remote degrading agricultural land | 2.5% | 2.5% | *0.1% |
| Rural population | 11,474,661 | 14,349,048 | 25.0% |
| Total population | 15,744,811 | 21,079,532 | 33.9% |

Note: Due to rounding, some figures in the text may not correspond with those reported in the tables or the sum of separate figures. * percentage-point difference between 2000-2010.

## 2.2 Regional and Global Overview

In Africa, 23% of the continent's rural population resided on degrading agricultural land in 2010, equivalent to 184 million people. Moreover, 6% of the total rural population – or 47.6 million people – lived in remote degrading agricultural land with limited access to markets.

The changes in these indicators between the period 2000 and 2010 for the region depict increases of 35% and 38% for the case of population residing in degrading agricultural land and remote degrading agricultural land respectively; whereas the overall population in rural areas grew at 27% over the same period (see table 2).

On a global level, it is estimated that about 1.5 billion people worldwide – equivalent to 32% of the total rural population – resided on degrading agricultural land in 2010. Furthermore, during the same year, 233 million people lived on remote degrading agricultural land with limited access to markets, representing 5% of the global rural population.

Among the world's regions suffering from land degradation, the most affected continent is Asia with 79% of the global rural population residing in degrading agricultural areas (or 1.1 billion people). The second most affected region is Africa, with a share of 12% in the global rural population living in degrading agricultural areas. The remaining 9% are spread across Europe (5%), Latin America and the Caribbean (3%), and Northern America and Oceania (1%).

Regarding changes over time for the period 2000-2010, the global rural population in degrading agricultural areas and remote degrading agricultural areas increased by 12% and 14%, respectively.

Table 2 contains additional details of the populations living in degrading agricultural areas and remote degrading agricultural areas by region and globally for the years 2000 and 2010, as well as the percentage changes during this decade.

**Table 2: Population on degrading agricultural land at regional[iii] and global scale[3]**

| Regions | Population in 2010 | | | | | % change from 2000 to 2010 | | |
|---|---|---|---|---|---|---|---|---|
| | Rural population (in millions) | Rural population on DAL (in millions) | % share | Rural population on remote DAL (in millions) | % share | Rural population | Rural population on DAL | Rural population on remote DAL |
| Africa | 812.6 | 184.0 | 22.6% | 47.6 | 5.9% | 26.8% | 34.7% | 37.6% |
| Asia | 3,102.9 | 1,176.8 | 37.9% | 175.0 | 5.6% | 12.2% | 10.9% | 8.6% |
| Europe | 310.1 | 75.6 | 24.4% | 2.5 | 0.8% | -2.6% | -6.5% | -5.9% |
| Latin America and the Caribbean | 350.9 | 48.2 | 13.7% | 7.2 | 2.1% | 14.1% | 17.8% | 16.4% |
| Northern America | 71.4 | 11.4 | 16.0% | 0.7 | 1.0% | 7.5% | 7.5% | 6.2% |
| Oceania | 16.0 | 0.9 | 5.4% | 0.3 | 1.8% | 15.0% | 0.8% | 39.3% |
| World Total | 4,663.9 | 1,496.9 | 32.1% | 233.3 | 5.0% | 13.4% | 12.4% | 13.6% |

Note: DAL= Degrading Agricultural Land

# 3. Economics of Land Degradation

## 3.1 National Overview

Land provides valuable ecosystem services for human well-being, but land degradation leads to a reduction in the provision of these services with significant social and economic costs to the country. The decline of ecosystem services can take different forms, including decline in food availability, soil fertility, carbon sequestration capacity, wood production, groundwater recharge, among others.[6, 7, 9]

The costs of land degradation for the country are measured in terms of the changes in land productivity by considering two aspects: changes in land cover from a high-value biome to a lower-value biome (e.g. forest land converted to cropland); and the decline in ecosystem services provision within a certain land cover type due to degrading land-use practices (e.g. reduced cropland productivity over time).[6]

**Table 3: Economics of land degradation (LD) in Madagascar**[4, 6, 8]

| | |
|---|---|
| Total annual cost of land degradation (base year 2007) | 1.7 bn USD |
| Cost of LD due to the decline in provisioning ecosystem services (as % of total cost) | 49% |
| Cost of land degradation as % of GDP | 23% |
| Cost of action (30-year planning horizon) | 25.5 bn |
| Cost of inaction (30-year planning horizon) | 92.7 bn |
| Returns on action against land degradation per dollar invested | 4 USD |
| GDP 2016 (USD) | 10 bn |
| Share of Agriculture in total GDP 2016 | 24% |
| GDP per capita 2016 (USD) | 401 |

Note: bn = billion

In Madagascar, the total annual cost of land degradation is estimated at 1.7 billion United States Dollars (USD) — this is equal to 23% of the country's Gross Domestic Product (GDP).[iv] Moreover, a considerable share of the costs of land degradation (49%) is due to the decline in provisioning ecosystem services (e.g. food availability, wood production, etc.), which has a significant impact on the population of the country. The remaining share refers to the regulating ecosystem services (e.g. carbon sequestration, water regulation flows), which has an impact not only at the country level, but also on the regional and global scale due to the transboundary nature of these services that provide incentives for international cooperation (see table 3).[v]

Land degradation often stems from land-use decision-making processes driven by high market prices of specific ecosystem services — for example, food. In this context, land-use decisions may largely neglect the significance of other ecosystem services for which no markets exist, but which are also of high value to the society.[9]

Given the significant economic burden of land degradation, research has also focused on the study of the costs of action against land degradation through restoration and sustainable land management practices. These costs of action are often compared to the costs of inaction — the latter being derived from the projection of past degradation rates to the future.

In this context, a recent global assessment on land degradation[6] shows that for Madagascar the returns on taking action against land degradation versus inaction are estimated at 4 USD for every dollar invested in reverting degraded land,[vi] underlining the strong economic incentives for bold actions on achieving LDN.

## 3.2 Regional and Global Overview

For Africa, the total annual costs of land degradation are estimated at 65 billion USD, which amounts to about 4% of the total GDP of the region. This share, however, varies considerably among countries.

On a global scale, the costs of land degradation are estimated at about 297 billion USD.[vii] As illustrated in table 4, Asia accounts for the largest share of the total global cost of land degradation (28%), followed by Africa (22%), Latin America and the Caribbean (20%), Northern America (12%), Europe (12%) and Oceania (5%).

Assessments of the cost of action against land degradation versus the cost of inaction show that the latter significantly outweighs the former. On the regional level, the costs of action for Africa are estimated at 731 billion USD, whereas the costs of inaction equal about 3.1 trillion USD[vi] (see table 4). The regional breakdown reveals social returns ranging from about 4 USD in the case of Asia, Africa, and Latin America and the Caribbean, and up to 6 USD in Europe, Northern America, and Oceania (see table 4).

On a global level, estimates show costs of action in the amount of 4.6 trillion USD, whereas the costs of inaction equal about 23.2 trillion USD.[vi] That means that the expected social returns of taking action are estimated at about 5 USD for every dollar invested in the restoration of degraded land and sustainable land management.

**Table 4: Cost of land degradation at regional[iii] and global scale[(6)]**

| Regions | Cost of Land Degradation (LD) | | Cost of action and inaction | | |
|---|---|---|---|---|---|
| | Total annual cost of LD (in billion USD; year 2007) | % of the annual cost of LD in the world total | Cost of action in 30-year time horizon (in billion USD) | Cost of inaction in 30-year time horizon (in billion USD) | Returns on action against LD (in USD) |
| Africa | 65 | 22.0 | 731 | 3,112 | 4 |
| Asia | 84 | 28.4 | 976 | 4,359 | 4 |
| Europe | 35 | 11.8 | 945 | 5,652 | 6 |
| Latin America and the Caribbean | 61 | 20.4 | 789 | 3,107 | 4 |
| Northern America | 36 | 12.2 | 759 | 4,599 | 6 |
| Oceania | 15 | 5.2 | 407 | 2,442 | 6 |
| World Total | 297 | 100.0 | 4,606 | 23,272 | 5 |

# 4. Land and Climate Change

Land plays an important role in the global carbon cycle because terrestrial ecosystems continuously exchange carbon fluxes with the atmosphere. The exchange is two-way: on the one hand, terrestrial ecosystems sequester carbon through natural processes, and on the other hand, they release carbon through respiration as well as anthropogenic activities related to agriculture, forestry, and other land use. The role of terrestrial ecosystems as a source and sink of emissions positions land as a key element of intervention for climate change mitigation and adaptation.

## 4.1 National Overview

### Land as a Source of Emissions

The Agriculture, Forestry and Other Land Use (AFOLU) sector is an important source of Greenhouse Gases (GHG). Figures vary on how this sector contributes to the national emission inventories across countries. In Madagascar, the AFOLU sector is responsible for 89% of the total emissions of the country (see table 5).

Within Madagascar's AFOLU sector, the larger share of the emissions is from Forestry and Other Land Use (FOLU) subsector (60%). Emissions from Agriculture plays a minor role.

**Table 5: Land as a source and sink of emissions[10] in Madagascar (year 2010)**

| Sectors | GHG (Mt-$CO_2e$) | % |
|---|---|---|
| Sources total | 76.48 | 100.0 |
| AFOLU sources | 68.27 | 89.3 |
| Agriculture | 22.58 | 29.5 |
| FOLU net sources | 45.69 | 59.7 |
| Other sectors | 8.21 | 10.7 |
| Forest net sink | -11.81 | |
| FOLU total | 33.87 | |
| Total net emissions with FOLU | 64.66 | |
| Total net emissions per capita with FOLU (in tonnes of CO2e) | 3.1 | |

Note: GHG=Greenhouse Gases; Mt-$CO_2e$ = million tonnes of carbon dioxide equivalent.

### Land as a Carbon Sink

Terrestrial ecosystems also play an important role as carbon sinks, offsetting emissions released by various sectors of the economy. The removals of carbon emissions through Forest are estimated at 12 million tonnes of $CO_2$ in 2010 for Madagascar (see table 5). This is equal to 15% of the total emissions of the country. The potential carbon storage per hectare (ha) and year varies considerably depending on the type of biome, the practice on the ground, and the prevalent climate.[11] The mean rate of sequestration is estimated at 1.5 tonnes of carbon (tC)/ha per year, where 0.5 tC is from soil organic carbon sequestration and an additional 1.0 tC from biomass.[viii] [11]

In general, terrestrial ecosystems have a significant potential for carbon sequestration linked to the cumulative historic loss of carbon from land-use change. The capacity of land to further store carbon is crucial for bridging the time until new technologies to tackle climate change are adopted on a larger scale.[11]

The UNCCD Science Policy Interface developed the Land Degradation Neutrality (LDN) conceptual framework[12], which refers to three hierarchical policy responses to achieve LDN that go hand in hand with climate actions: i) **avoid** further land degradation by halting conversion of land types, for example, not converting forest land into agricultural land; ii) **reduce** the impact of land-intensive activities by using Sustainable Land Management (SLM) practices, so that less carbon is released from soil, crops and other biomass; and iii) **reverse** land degradation, for example, by restoring or rehabilitating land that has lost productivity.[12]

### Land as a cost-effective mitigation option

Within the various climate change mitigation alternatives, land-based mitigation options rank among the most cost-effective opportunities to sequester or avoid carbon.[13] The cost of capturing one tonne of carbon (tC) by restoring degraded land is estimated at 51 USD per tC; while alternative engineering techniques such as 'gas plant capture and carbon sequestration' have a cost of 306 USD per tC (see table 6). Moreover, land-based mitigation options are estimated to be more cost-effective than other widely-used strategies to avoid emissions — for example, the substitution of fossil fuels by solar or wind energy.[13, 14]

Moreover, it is worth noting that the option of storing carbon in terrestrial ecosystems by restoring land generates several other co-benefits that should also be factored in. They include for instance improving soil health, reducing food insecurity and enhancing water regulation flows.

**Table 6: Cost of carbon sequestration using different techniques**[ix] (13)(14)

| Technique/Strategy | Cost of abatement USD per tC |
|---|---|
| Second-generation biofuels | 25 |
| Pastureland afforestation | 51 |
| Degraded-land restoration | 51 |
| Degraded forest restoration | 61 |
| Agriculture conversion | 128 |
| Biomass co-firing power plant | 153 |
| Coal-C capture and sequestration | 229 |
| Gas plant capture and sequestration | 306 |
| Solar VP[x] | 92 |
| Wind[x] | 76 |

Note: tC= tonne of Carbon

Land matters play a key role in developing climate change mitigation and adaptation policies. Box 1 presents the leading land-based mitigation and adaptation strategies considered in Madagascar's Nationally Determined Contributions.

**Box 1. Highlights on Climate Change and Land from Madagascar's Nationally Determined Contributions**[15]

**Land-based mitigation plans**

**Agriculture, Forestry and Other Land Uses (AFOLU) targets**: 61 MtCO2 (32%) increase of absorption compared to BAU
**Reforestation:** reforestation of 270,000 ha
**Sustainable Land Management**: large scale reforestation for sustainable timber production and indigenous species for conservation; Reduction of forest timber extraction; Promotion of REDD+; Large scale adoption of agroforestry; Forest and grassland forests enhanced monitoring
**Agriculture**: Dissemination of arboriculture, from 2018 5,000 ha per year; Large scale dissemination of intensive/improved rice farming techniques (SRI/SRA); Large scale implementation of conservation agriculture and climate-smart agriculture;

**Land-based adaptation priorities**

**Reforestation:** Restoration of 35,000 ha of primary forest areas and mangroves by 2020 45,000 ha of forest area restored by 2025 Environmental amenities and ecosystem services associated with the restoration of 55,000 ha of forests and mangroves by 2030; Restoration of natural forests and reinforcement of habitat connectivity by 2020
**Sustainable Land Management:** Identification and sustainable management of climate refuge areas inside and outside protected areas by 2020
**Agriculture:** Paddy production maintained at 4 tons per hectare in agricultural centres that apply the Resilient Agriculture Integrated Models (climate-smart agriculture) by 2030
**Climate Smart Agriculture**: Development of Resilient Agriculture Integrated Model pilot projects/programmes (combination of watershed management, selected/adapted varieties, locally-produced compost, rehabilitation of hydro-agricultural infrastructures, input access facilitation system, conservation agriculture, and agroforestry) or "climate-smart agriculture" by 2020; Widespread application of Resilient Agriculture Integrated Models in major agricultural centre, cash crop zones, extensive livestock farming areas, priority areas for fisheries, mangroves, as well as drought hotspots (2020 - 2030)
**Crops**: Promotion of intensive/improved rice farming system and rain-fed rice farming technique by 2020
**Water Management:** Sustainable and integrated water resources management, particularly in sub-arid areas and those vulnerable to drought periods (2020 - 2030)
**Ecosystem and Biodiversity**: Restoration of natural habitats (forests and mangroves: 45,000 ha; lakes, streams, etc.) (2020-2030); Implementation of ecosystem-based adaptation to cope with sand-hill progression (multiple causes but phenomena aggravated by climate change) by leveraging research findings and best practices (2020 - 2030)
**Coastal Management**: Reinforcement of natural protection and reduction of the vulnerability of coastal, inshore and marine areas affected by coastal erosion and receding shorelines progress (Menabe, Boeny, South-west and East) (2020 - 2030)
**Disaster Risk Management (DRM):** Multi-hazard early warning systems primarily that mainly consider cyclones, floods, drought and the public health surveillance by 2020; Effective implementation of multi-hazard early warning systems, including cyclones, floods, food security, drought, hunger, health and phytosanitory monitoring by (2020 - 2030)
**Capacity Building and Knowledge Transfer**: Finalisation and implementation of the NAP; Strengthen climate change adaptation mainstreaming in all strategic/framework documents by 2020; Intensive awareness raising campaigns concerning the adverse effects of climate change and environmental degradation by 2020

## 4.2 Regional and Global Overview[xi]

In Africa, 63% of the total emissions released were from the Agriculture, Forestry and Other Land Use (AFOLU) sector in the year 2010. This percentage represents 2,610 Mt-CO2e out of the total 4,109 Mt-CO2e emitted in the region (see table 7). In the AFOLU sector, the 'Forestry and Other Land Use (FOLU)' subsector accounts for 44% (or 1,816 Mt-CO2e), while the 'Agriculture' subsector is responsible for 19% (or 794 Mt-CO2e) of the total emissions from the region.

At a global level, it is estimated that the AFOLU sector is responsible for 23% of the GHG emissions, which is equal to 11,380 Mt-$CO_2e$ (see table 7). Breaking down the AFOLU sector into 'Agriculture and 'FOLU' shows that the majority of emissions come from the latter subsector with a total amount of 6,304 Mt-$CO_2e$; while Agriculture emitted 5,075 Mt-$CO_2e$.

Regarding the regional contributions to the global emissions of the AFOLU sector, greenhouse gas (GHG) inventories report that the Asia region is the leading contributor of global AFOLU emissions. Asia is responsible for 35% of global AFOLU emissions, followed by Latin America and Africa which are responsible for 24% and 23% of emissions respectively. Table 7 displays further details of the regional contributions of the AFOLU sector in relation to the total global emissions as well as the regional breakdown for the Agriculture and FOLU subsectors.

Evidence also shows that the global forest ecosystems alone removed 3,234 Mt-$CO_2e$ from the atmosphere in the year 2010 (see table 7). More generally, out of the total global carbon emissions to the atmosphere by human activities, an estimated 42% are accumulated in the atmosphere; another 23% is sequestered by the oceans; and the remaining 34% is attributed to sequestration by terrestrial ecosystems,[11] highlighting the essential role of land-based ecosystems to mitigate climate change.

**Table 7: Regional[iii] and global emissions/removals from the Agriculture, Forestry and Other Land Use (AFOLU) sector and related indicators[10] in 2010**

| Regions | Sources total | | AFOLU Net sources | | Agriculture | | FOLU net sources | | Forest net sink | | Total emissions per capita with FOLU |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mt-$CO_2e$ | in % | Mt-$CO_2e$ | in % | Mt-$CO_2e$ | in % | Mt-$CO_2e$ | in % | Mt-$CO_2e$ | in % | Mt-$CO_2e$ |
| Africa | 4,109 | 8.3 | 2,610 | 22.9 | 794 | 15.7 | 1,816 | 28.8 | -159 | 4.9 | 3.8 |
| Asia | 23,421 | 47.5 | 3,974 | 34.9 | 2,262 | 44.6 | 1,712 | 27.2 | -936 | 28.9 | 5.4 |
| Europe | 8,268 | 16.8 | 875 | 7.7 | 567 | 11.2 | 308 | 4.9 | -847 | 26.2 | 10.1 |
| Latin America and the Caribbean | 4,838 | 9.8 | 2,724 | 23.9 | 896 | 17.7 | 1,828 | 29.0 | -545 | 16.9 | 7.2 |
| Northern America | 7,711 | 15.6 | 752 | 6.6 | 406 | 8.0 | 346 | 5.5 | -494 | 15.3 | 21.0 |
| Oceania | 1,001 | 2.0 | 445 | 3.9 | 150 | 3.0 | 295 | 4.7 | -253 | 7.8 | 20.7 |
| World total | 49,349 | 100 | 11,380 | 100 | 5,075 | 100 | 6,304 | 100 | -3,234 | 100 | 6.7 |

Note: Mt-CO2e = million tonnes of carbon dioxide equivalent; FOLU= Forestry and Other Land Use.

# 5. Opportunities – The Way Forward

The 2030 Agenda for Sustainable Development offers opportunities for countries to curb the growing threats of land degradation and to reap multiple socioeconomic benefits of LDN. Sustainable Development Goal 15 'Life on Land' and its target 15.3 on Land Degradation Neutrality (LDN) particularly encourage countries to 'combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world by 2030'.

In October 2015, UNCCD country Parties decided that striving to achieve SDG target 15.3 is a strong vehicle for driving the implementation of the Convention and requested the UNCCD secretariat and appropriate UNCCD bodies to take the initiative and invite other relevant agencies and stakeholders to cooperate on achieving SDG target 15.3 (decision 3/COP12).

To achieve SDG target 15.3, the following five elements have been identified:

(1) **LDN targets**: setting targets and establishing the level of ambition;
(2) **Leverage and impact:** catalyzing the multiple benefits that LDN provides from climate change mitigation and adaptation to poverty reduction;
(3) **Partnerships and resource mobilization**: rationalizing engagement with partners, overcoming fragmentation and systematically tapping into increasing finance opportunities, including climate finance;
(4) **Transformative action**: designing and implementing bold LDN transformative projects that deliver multiple benefits; and
(5) **Monitoring and reporting**: tracking progress towards achieving the LDN targets.

As of April 2018, 116 countries have made the commitment to translate the global goal of achieving LDN by 2030 into national action by setting national voluntary targets with the support of the LDN Target Setting Programme (LDN TSP) – a programme established by the Global Mechanism in collaboration with the UNCCD secretariat and supported by various partners.

Madagascar is among the countries that have committed to achieve Land Degradation Neutrality by 2030, established an LDN baseline, and formulated associated measures (see box 2).

The LDN targets provide Madagascar with a strong vehicle for fostering coherence of policies and actions by aligning the national LDN targets with measures from the Nationally Determined Contributions and other national commitments, such as the restoration of 4 million hectares of degraded land under the Bonn Challenge and AFR100 initiatives. Investing in LDN also accelerates the advancement of other SDGs due to the close linkages between land and other goals and targets, such as: Goal 1 (No poverty), Goal 2 (Zero hunger), Goal 5 (Promote gender equality), Goal 6 (Clean water and sanitation), Goal 8 (Decent work and economic growth), and Goal 13 (Climate action).[16]

Regarding SDGs in general, Madagascar has updated the National Strategy for the Development of Statistics (NSDS) to ensure good planning - especially for effective monitoring of development results, including priority targets of the SDGs at national, sectoral and regional levels. Madagascar has also organized thematic and sectoral consultations with the view of refining the preliminary prioritization results for validation, which aims at having a set of priority targets for the SDGs.[17]

## Box 2. Madagascar's National Voluntary LDN Targets and Measures [18]

### Global target

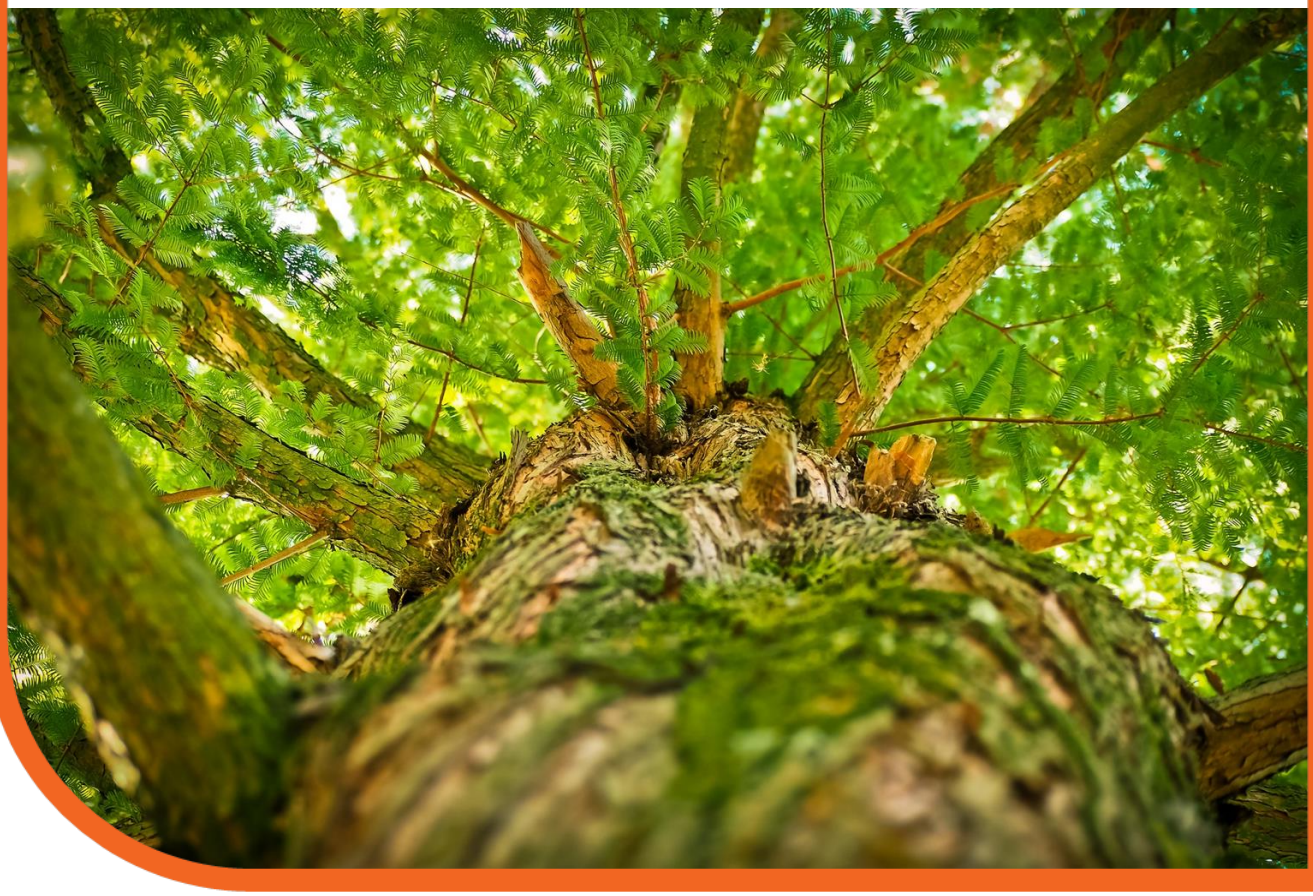
Madagascar commits to achieving Land Degradation Neutrality by 2030.

### Specific Targets

- Improve productivity and carbon stocks in cultivated areas and grazing areas
- Improve the cover of green infrastructure
- Reduce conversion of forests into other types of land cover by 2030
- Reduce conversion of wetlands into other types of land cover by 2030

### Identified measures to achieve Land Degradation Neutrality

- Integrate the concept of land degradation neutrality within land planning
- Integrate the concept of land degradation neutrality within the making and/or implementation of sectoral policies/strategies
- Each year, practice sustainable agriculture within parcels totaling at least 200,000 ha by 2025
- Reduce pasture fires by 2030
- Each year, restore 400, 000 ha of landscapes using green infrastructure by 2025
- Reinforce intersectoral innovation capacity through sustainable land management
- Mobilize financial incentives to promote research on sustainable land management in relation to biodiversity and climate change



# 6. Ongoing Projects and Programmes

To illustrate land-based approaches, the following section features some of the ongoing projects and programmes supported by national and international organizations.[xii]

**Sustainable Agriculture Landscape Project.** The objective of the project is to increase access to improved irrigation services and agricultural inputs and strengthen the integrated management of natural resources in the targeted landscapes by the local actors and, to provide immediate and effective response to an eligible crisis or emergency. Funding Source: GEF Trust Fund. Implementing Agency: The World Bank. GEF Project Grant/Co-financing Total: 13.70 million USD/93.00 million USD. Link: for further information click here.

**Participatory Sustainable Land Management in the Grassland Plateaus of Western Madagascar.** The project purpose is to reverse land degradation and improve living conditions in the Bongolava region of western Madagascar through participatory sustainable management of the grasslands. Funding Source: GEF Trust Fund. Implementing Agency: United Nations Environment Programme. GEF Project Grant/Co-financing Total: 1.59 million USD/5.35 million USD. Link: for further information click here.

**Alignement of National Action Programme to the UNCCD 10 Years Strategy and Preparation of the Fifth Reporting and Review Process.** The aim of the project is to facilitate access to GEF funding by Madagascar for enabling activities to meet their obligations under the UNCCD. Funding Source: GEF Trust Fund. Implementing Agency: United Nations Environment Programme. GEF Project Grant/Co-financing Total: 136.364 USD/150.000 USD. Link: for further information click here.

**Madagascar Agriculture Rural Growth and Land Management Project.** The objective of the project is to improve rural land tenure security and access to markets of targeted farming households in selected agricultural value chains in the project areas, and to provide immediate and effective response to an eligible crisis or emergency. Financier: International Development Association. Implementing Agency: Ministry of Agriculture. Total Project Cost: 53.27 million USD. Link: for further information click here.

**Emergency Support of Vulnerable Population Affected by Recurrent Drought in Androy Region.** Financier: Trust Funds. Total Budget: 341.550 USD. Link: for further information click here.

**Sustainable Landscapes in Eastern Madagascar.** The development objective of the project is to investigate landscape measures to enhance resilience of smallholders, reducing greenhouse gas emissions and channelling private finance into climate-smart investments in agriculture and renewable energy. Link: for further information click here.

**Enabling Climate Resilience in the Agriculture Sector in the Southwest Region of Madagascar.** The project objective is to secure and improve rural farmers' livelihoods through water management and health interventions in Southwest Madagascar. Funding Source: GEF Trust Fund. Implementing Agency: African Development Bank. Executing Agencies: Ministry of Agriculture (Regional Rural Development Unit of Tulear and Rural Engineering Unit), Madagascar, Ministry of Environment and Forests GEF Project Grant/Co-financing Total: 6.2 million USD/37.2 million USD. Link: for further information click here.

# 7. Country Studies

For further reading, this section offers country studies that may be useful in making the case for investing in Land Degradation Neutrality.

**National Action Programme of Madagascar.** — (2001).

**Organic Matter Sources and Early Diagenetic Degradation in a Tropical Peaty Marsh (Tritrivakely, Madagascar). Implications for Environmental Reconstruction during the Sub-Atlantic**. — Bourdon, S. et al. (2000).

**Farming at the Forest Frontier: Land Use and Landscape Change in Western Madagascar, 1896–2005**. — Scales, I. (2011).

**Recovery of Plant Species Richness and Composition after Slash-and-Burn Agriculture in a Tropical Rainforest in Madagascar**. — Klanderud, K. et al. (2010).

**Deforestation and Cultivation Effects on Characteristics of Oxisols in the Highlands of Madagascar**. — Tor-Gunnar. et al. (2006).

**Environmental Degradation Narratives in Madagascar: From Colonial Hegemonies to Humanist Revisionism**. — Pollini, J. (2010).

**What Can Forest Values Tell Us about Human Well-Being? Insights from Two Biosphere Reserves in Madagascar**. — Fritz-Vietta. et al. (2016).

# 8. Supplementary Information

## 8.1 Glossary

This subsection provides a brief description of the indicators presented above.

### Annual cost of land degradation

The UNCCD defines land degradation as 'any reduction or loss in the biological or economic productive capacity of the land resource base. It is generally caused by human activities, exacerbated by natural processes and often magnified by and closely intertwined with climate change and biodiversity loss.' In the study featured here on the cost of land degradation, Nkonya and colleagues[6] approach the study of land degradation by investigating declines in land productivity in the past due to: i) land cover changes from a high value-biome to a lower-value biome, such as the conversion from forest land into cropland; and ii) declines in the ecosystem services provision within a land cover type due to the use of degrading practices.

### Cost of action

The costs of action are estimated by taking into account the following two cost categories: i) initial fixed investments and maintenance expenses that are related to the restoration of the high-value biome until it reaches biological maturity; ii) the inclusion of the opportunity cost given by the forgone benefits from the lower-value biome under replacement. The analysis of the cost is carried out over a planning period of 30 years.[6]

### Cost of inaction

Cost of inaction represents the 'business as usual' (BAU) scenario. In this case, future land degradation trends are assumed to continue along patterns similar to those of the past. The total costs of inaction are calculated by the sum of future annual costs of land degradation over a 30-year planning horizon - where land degradation is captured by land cover changes from a high-value biome to a lower-value biome.[6]

### Returns of action

Nkonya and colleagues[6] measure the benefit of action as the difference between the cost of inaction minus the cost of action. When this difference is positive, then taking action is justified in economic terms. Moreover, the figures on returns on investment are calculated as the cost of inaction over the cost of action. For further methodological details on the annual cost of land degradation, cost action, inaction and returns on action, see Nkonya and colleagues.[6]

### Population on degrading agricultural land

Estimates of the population in degrading agricultural areas are based on the work of Barbier and Hochard.[3] They identify agricultural degrading land by looking at the areas that experienced negative changes in net primary productivity, using the Normalized Difference Vegetation Index. Note that estimates are mainly constrained to populations residing on 'agricultural land' in this study; the consideration of other land cover types may therefore increase the magnitude of these figures. Regarding data on the spatial distribution of rural population, this study uses data published by the Global Rural-Urban Mapping of the Socioeconomic Data and Applications Center (SEDAC). In order to further identify population in remote areas, Barbier and Hochard[3] use data from the Global Environment Monitoring Unit of the Joint Research Centre of the European Commission.

### Rural poverty

The rural poverty headcount ratio is used to calculate rural poverty, i.e. the percentage of rural population living below the national poverty line. National poverty line is the benchmark for estimating poverty indicators that are consistent with the country's specific economic and social circumstances and reflect local perceptions of the level and composition of consumption or income needed to be non-poor.[4]

**Sustainable Land Management**

SLM is the use and management of land resources– soil, water, animals and plants – for the production of goods to meet changing human needs, while ensuring the long-term productive potential of these resources and the maintenance of environmental functions. Degradation of water, soil and vegetation as well as emissions contributing to climate change can be limited through SLM practices that simultaneously conserve natural resources and increase yields.

# 8.2 Notes

i. Figures on population on degrading agricultural land are calculated by using the shares of rural population on degrading agricultural land and remote degrading agricultural land estimated in the work of Barbier and Hochard[3], in combination with data on rural population from the Word Bank Development Indicators.[4]

ii. Population in remote degrading areas is identified in terms of market accessibility, where access to market is defined as less than five hours of travel to a market city with a population of 50,000 or more.[3]

iii. Country grouping is based on geographic regions as defined by the United Nations Statistics Division (see: https://unstats.un.org/unsd/methodology/m49/.)

iv. Estimates of the economic costs of land degradation illustrated in this country profile are based on the work of Nkonya and colleagues.[6]

v. The relationship between food production (provisioning ecosystem service) and the supply of other ecosystem services often depicts important trade-offs.[1]

vi. These figures correspond to a 30-year planning horizon in terms of quantification of costs and benefits.

vii. Global estimates of the costs of land degradation vary to a great extent depending on the study. A study led by the Economics of Land Degradation Initiative[9] estimates the global costs of land degradation at 9.6 trillion USD. In this regard, the figures presented in the current publication are conservative.

viii. This is a global average coefficient used as a default in this publication, and it should be replaced with that of national level when available. Note also that one tonne of carbon (C) is approximately equivalent to 3.66 tonnes of carbon dioxide ($CO_2$).

ix. This version of the country profile uses the 'Global GHG Abatement Cost Curve' as default information.[14] National GHG Abatement Cost Curve should be used when available.

x. Although solar and wind power are not sequestration techniques, but rather technologies that avoid (or reduce) emissions from the source, figures still show how competitive is restoring degraded land in comparison with solar or wind abatement alternatives.

xi. Figures related to Greenhouse Gases in this subsection are retrieved from FAOSTAT.[10]

xii. The information on projects and programmes presented in this section has been obtained from the websites of the following organizations: Climate Investment Funds, Food and Agriculture Organization of the United Nations, Global Environment Facility, Green Climate Fund, United Nations Development Programme, United Nations Environment Programme and the World Bank.

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## 8.4 Photos

Cover http://pexels.com
p.7 http://pexels.com
p.13 https://pixabay.com/
p.9 http://pexels.com
Back cover http://pexels.com

## 8.5 About this Publication

This country profile is intended to provide a brief overview of recent studies, assessments and indicators that demonstrate multiple benefits of taking bold actions to achieve Land Degradation Neutrality.

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