



SECOND NATIONALLY DETERMINED  
CONTRIBUTION FROM THE REPUBLIC OF  
MADAGASCAR  
UNDER THE PARIS AGREEMENT

NOVEMBER 2022

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# List of abbreviations

°C Degree Celsius

CDN1 First Nationally Determined Contribution

AFR100	« African Forest Landscape Restoration Initiative »	of the Republic of Madagascar
NBCC	National Coordination Office Nation of Changes Cli and REDD+	CDN2 Second Assessed Contribution at the National of the Republic of Madagascar
BNGRC	National Management Office Risk and Disaster Management	CH4 Methane
UNFCCC Convention	United Nations Framework Convention	cm Centimetre
AIC	United on Change Climate Climate-smart agriculture	CMA "Conference of parties serving as meeting of the Paris Agreement"
CBIT	"Capacity Building Initiative for the Transparency of the Paris Agreement"	CNA Normal Business Course
NDC	Nationally Determined Contribution to the Paris Agreement on Climate Change	CNI Initial National Communication to the United Nations Framework Convention on Climate Change
		CO2 Carbon dioxide
		CPGU Emergency Prevention and Management Unit
		CSB Basic Health Center

CTD	Decentralised local authorities	Ha	Hectare
DCN	Second National Communication to the United Nations Framework Convention on Climate Change	m2	Square metre
		m3	Cubic metre
		MEDD	Department of the Environment and Sustainable development
EDBM	"Economic Development Board of Madagascar"	mm	Millimetre
FTM	"Foibe Taosarintanin'i Madagasikara" (National Geodesic and Cartographic Institute)	MRV	"Measuring, reporting, verifying"
GHG	Greenhouse Gases	MW	Megawatt
Gg eq. CO2	Gigagram (x 109 grams) CO2 equivalent	MWp	Megawatt-peak
		MWh	Megawatt-hour
		N2O	Nitrous oxide
IPCC	Intergovernmental Panel on Climate Change		
GPG	Good Practices Guides, Good Practice Recommendations for the Land Use, Land-Use Change and Forestry Sector (IPCC 2000); and Good Practice Recommendations for Land Use and Forestry	PANA	National Action Programme on Adaptation to Climate Change
		LGD	Communal Development Plans
		GDP	Gross domestic products
	land use, land-use change and forestry sector (IPCC 2003)	PNA	National Plan for Adaptation to Change Climate
IWRM	Integrated Water Resources Management	BAG	Municipal development plans
ICAM	Intoxication Due to Consumption Marine Foods	SAP	Early warning systems
IRA	Acute respiratory infections	SRAT	Regional Spatial Planning Schemes
Kg	Kilogram	NCCRP	National policy to combat Climate Change Revised
Miles	Kilometre	NCLCP	National Policy for the Fight against Violence Climate Change
km2	Square kilometre	PPN	Basic Essentials
ktoep	Kiloton of oil equivalent		
Kw	Kilowatt	REDD+	Reduction of emissions from deforestation and forest degradation, associated with sustainable forest management, conservation and enhancement of forest carbon stocks
KWh	Kilowatt-hour		
LEG	"Least developed countries' Expert Group of the UNFCCC"	SDAGIRE	Development and Integrated Water Resources Management Schemes

STD	Decentralised territorial services	NAC	Normal Business Course
TCN	Third National Communication to the United Nations Framework Convention on Climate Change	CNI	Initial National Communication to the United Nations Framework Convention on Climate Change
USD	United States Dollar	CO2	Carbon dioxide cm
CDN1	First Assessed Contribution at the National of the Republic of Madagascar	CPGU	Emergency Prevention and Management Cell CSB Basic Health Center
CDN2	Second Nationally Determined Contribution of the Republic of Madagascar	UNFCCC	"United Nations Framework Conventions on Climate Change". See UNFCCC
CH4	Methane	LULUCF	Land Use, Change Land Use and Forestry
CMA	"Conference of parties serving as meeting of the Paris Agreement"		

The Republic of Madagascar is located to the east of the African coast. The territory includes the Great Island which stretches from north to south over a geographical distance of more than 1500 km, between 12 and 25° south latitude, almost in an intertropical environment, and occupies an area of 587,041 km<sup>2</sup>. Madagascar also has maritime territories with islets, atolls and archipelagos that are submersible by rising sea levels.

The climate of Madagascar is divided into two seasons: a hot and rainy season, from November to April, and a cool and dry season between May and October. The hot season is characterized by the formation of cyclonic disturbances in the southwest Indian Ocean basin, affecting the country on average three to five times a year. The average annual temperature on the Big Island is 24 to 27 °C. The average annual rainfall decreases from north to south, from 1,500 mm to minus 0.400 mm per year.

On the subject of climate change, the rise in temperatures is manifested by an increase of 0.27°C in the national average every 10 years. The change in rainfall patterns is reflected in the lengthening of dry seasons, the intensification of torrential rains and an 8% decrease in rainfall since 1990. Between 1990 and 2020, Madagascar recorded

70 major climatic disasters, including 64 cyclonic disturbances and six episodes of severe drought. Sea level rise reached 0.6 cm per year between 1994 and 2008. By 2050, the following changes are expected to occur with high probability : decreases in precipitation by up to -8%; reduction in the quantity of water available by 25% in the North and East and by 40% in the South-West; temperature rise from +1.2 °C to +2.1 °C; and a sea level rise of up to 43 cm (2080).

In 2020, Madagascar had a population of 27.2 million. The population growth rate is 3%. The population is very young: more than 85% of the inhabitants are under 45 years old and about 28% are young children (under 10 years old). The rural-urban disparity is very marked on

many aspects of socio-economic development, including the unequal distribution of population and wealth distribution in general. Madagascar is a less advanced country, not very industrialized and with sparsely populated infrastructure. The national economy is highly dependent on primary sectors. More than 83% of the population lives from agriculture. Rice cultivation dominates, employs 80% of the agricultural population and is the most widely cultivated food commodity. Cash crops are exported at 90%, represent 30% of exports, and are the most important sources of added value for the national economy. Annual agricultural growth (1.0% over the last decade) is often wiped out by climatic fluctuations and other endogenous factors. Fishery resources account for about 6% of GDP and 6% of exports. The exploitation of the fishing potential is not optimised and employs only 5% of the population. The exclusive economic zone and the vast coastal and mangrove areas favourable to aquaculture are almost unexploited, and current activities are adversely affected by the destruction of mangroves and coral reefs and global warming. Tourism, which accounted for 15% of GDP in 2020, depends mainly on natural ecosystems and biodiversity, and tourism infrastructure is sensitive to cyclone hazards.

For Madagascar, access to sustainable development and the fight against poverty are the pillars of the fight against the harmful effects of global warming. In 2020, multidimensional poverty reached 74% and the prevalence of malnutrition reached 48% of the population. The main causes of malnutrition are poverty, lack of education, climatic hazards, traditional agricultural practices and insufficient resources for hydro-agricultural infrastructure. From 2015 onwards, food insecurity alert areas are focused on the Great South, where severe food insecurity affects 1.31 million people in December 2021 and 500,000 people have urgent nutritional needs. Over the past 10 years, Madagascar has seen an increasing number of

deaths due to climate-sensitive diseases. Deforestation and the destruction of natural ecosystems are among the biggest drivers of climate vulnerability, through the loss of ecosystem services. In 2020, total forest cover was estimated at 12.4 million ha, including 5.6 million ha of moist evergreen forests and 6.7 million ha of dry forests, thickets, mangroves and reforestation forests. The average annual deforestation rate is 1.5% in 2019. Land degradation concerns

12 of the 23 regions of Madagascar, with an area of 70,000 km<sup>2</sup> requiring immediate action in 2024.

Forest loss and land-use change are the most important causes of the decline in national greenhouse gas absorption capacities. Between 2010-2020, they are the main sources of greenhouse gases, accounting for more than 80% of national emissions. Agriculture is the second largest emitter of greenhouse gases, contributing to 16% of national emissions. Subsistence agriculture (traditional rice farming, maize, cassava, extensive cattle farming) is rapidly destroying forest and wetland carbon stocks.

In 2010, energy was responsible for 2% of national emissions. The Residential sub-category (including cooking energy: more than 90% of the population uses wood energy as fuel) remains the largest user of energy. It is followed by the Energy Industries. Fossil fuel consumption for transport (road and rail) is estimated at half of the total volume imported, i.e. about 500,000 m<sup>3</sup>. The country's hydrocarbon supply is exclusively dependent on imports, and the national energy supply chain is extremely vulnerable to climatic hazards. The energy industries and transport are important factors in socio-economic development, but the related infrastructure is regularly impacted by cyclone disturbances and lacks maintenance. "Industrial Processes and Product Use" and "Waste"





together accounted for only about 0.4% of national emissions in 2010. Emissions from the Waste sector tend to increase with the rapid growth of the population. For the Industrial Processes and Product Use sector, the country's raw material potential calls for precaution.

Trends in emissions and removals at the national level call for more rigorous mitigation actions. Madagascar considers that these needs to contribute more to global efforts to reduce emissions should benefit the sustainable development and environmental integrity of the country. These contributions require policy and strategic frameworks to create enabling and incentivizing environments, enhancing the participation of all actors at all levels.

Madagascar is making efforts to achieve sustainable development. These efforts are based on the modernization of existing production sectors and industrialization. Some daily needs, for which the country has significant potential (textiles and clothing, construction materials, medicines, hydrocarbons, etc.), are almost exclusively imported. The situations observed within each sector (and the projected scenarios) of socio-economic development call for capacity building for adaptation and reduction of climate vulnerabilities.

The NDC2 takes into account existing strategic documents such as (i) the revised National Climate Change Policy (PNLCCr, 2021) which serves as a reference for all

actions to combat climate change in Madagascar; (ii) the National Action for Appropriate Mitigation (ANAA, 2003) which aims to reduce greenhouse gas emissions in a context of sustainable development; (iii) the country also has a National Adaptation Plan (NAP, 2021) which will serve as a strategic framework for priority adaptation actions in the medium and long term. This document is also articulated with the General State Policy (PGE) including the Madagascar Emergence Plan (South) and the Madagascar Emergence Plan (PEM) existing laws, policies, strategies, national and sectoral plans.

Thus, the NDC2 is positioned as a more ambitious strategic planning document to combat climate change for the next five years to which all actions at the national level should refer. A list of the main reference instruments is given in Section 5 (Institutional Arrangement). The Government of Madagascar has entrusted the development of the NDC2 to the Ministry of Environment and Sustainable Development (MEDD). This process involved the departments and institutions responsible for the implementation of sectoral programmes to combat climate change, as well as decentralized local authorities, technical and financial partners, the private sector and civil society organizations.

Progress from the previous Nationally Determined Contribution (Article 4(3) of the Paris Agreement), gradual transition towards economy-wide emission reduction targets, taking into account different national circumstances

### Greenhouse gas sources and impacts

NDC1 considered only the following sectors: Agriculture, Energy, LULUCF and Waste. NDC2 included the Industrial Processes and Product Use sector. This has raised the ambitions in relation to the sources.

### Ambitions to reduce emissions and increase absorption capacities

By 2030, the CDN2 aims to reduce greenhouse gas emissions by 28%, or 48,403 Gg eq. CO<sub>2</sub>. In addition to this reduction in emissions, the NDC2 aims to increase the capacity of its greenhouse gas absorption by around 20%, i.e. -37,809 Gg eq. CO<sub>2</sub> from additional sequestration.

By 2030, the NDC1 has targeted a 14% reduction in direct greenhouse gas emissions, equivalent to 29,990 Gg eq. CO<sub>2</sub> and an additional sequestration of -61,000 Gg CO<sub>2</sub> eq. CO<sub>2</sub>, i.e. 32% strengthening of carbon sinks. The mitigation ambitions presented in NDC2 appear to have regressed compared to those of NDC1; but they are realistic and achievable, and reflect the realities of current and projected sectoral policies and socio-economic contexts. For LULUCF, mitigation potentials for mitigation actions were not fully enshrined in NDC2 as only 25-30% of the sector's mitigation outcomes will be expressed by 2030.

### Methodological and metric approaches used for estimating and accounting for greenhouse gas emissions and removals

The national greenhouse gas inventories greenhouse built in Madagascar (CNI, DCN, TCN and

CDN1) serve as the basis for the development of CDN2. These inventories use the Revised 1996 IPCC Guidelines, supported by the IPCC Recommendations on Good Practice and Uncertainty Management for National Greenhouse Gas Inventories (GPG 2000) and the Good Practice Recommendations for the LULUCF Sector (GPG 2003). All greenhouse gas inventories at the sector level are Tier 1.

Madagascar is currently in the process of preparing its first Biennial Updated Report and its Fourth National Communication. The results of the inventories corresponding to these national reports will make it possible to update greenhouse gas estimates and emissions. They will feed into the update of the NDC from 2025.

The NDC2 includes sectoral and regulatory policy-making activities that should enable the country to gradually scale up its climate actions, in parallel with its Sustainable Development Goals. In addition, the implementation of many climate actions is cross-sectoral and is an action to scale up initiatives already started before 2020.

The operationalization of the national and sectoral MRV systems will make it possible to collect data that will allow the country to gradually move towards a political reflex of reducing emissions at the level of the economy. To this end, as stipulated by Article 4, paragraph 5, of the Paris Agreement, as a developing country and adaptation is a priority, the Government of Madagascar intends to benefit from the support of the other Parties to the Paris Agreement for the achievement of the objectives contained in its NDC2

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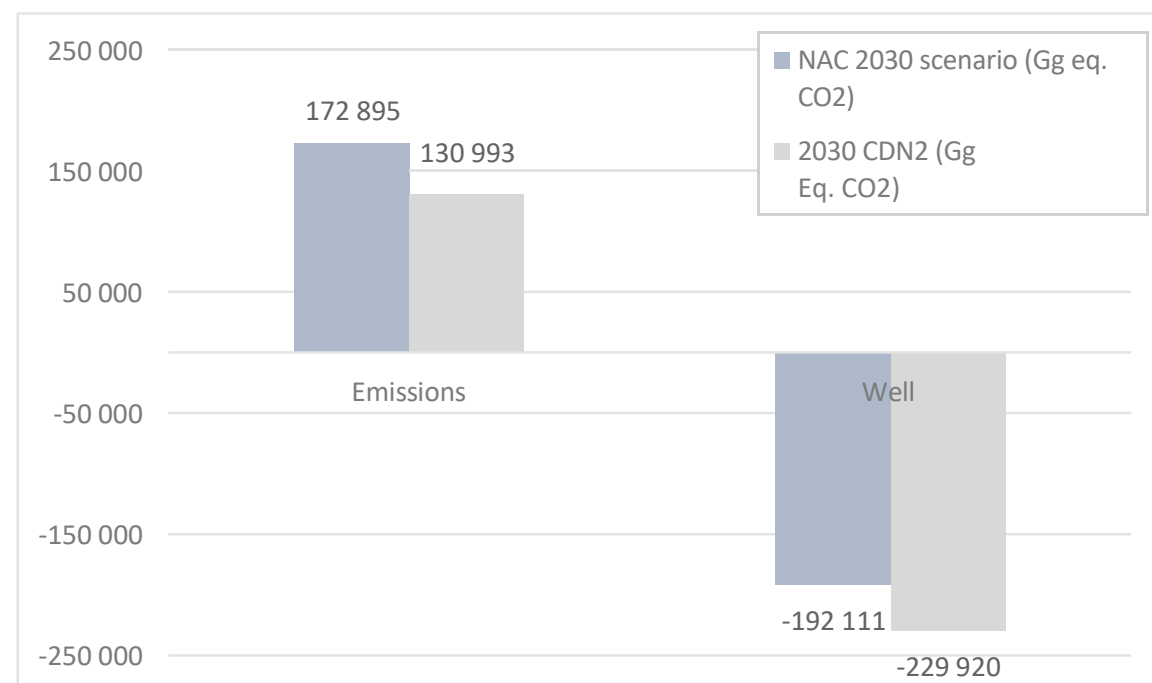


FIGURE 1: EMISSIONS AND REMOVALS, NORMAL COURSE SCENARIO CASES, COMPARED TO GREENHOUSE GAS MITIGATION SCENARIOS IN 2030

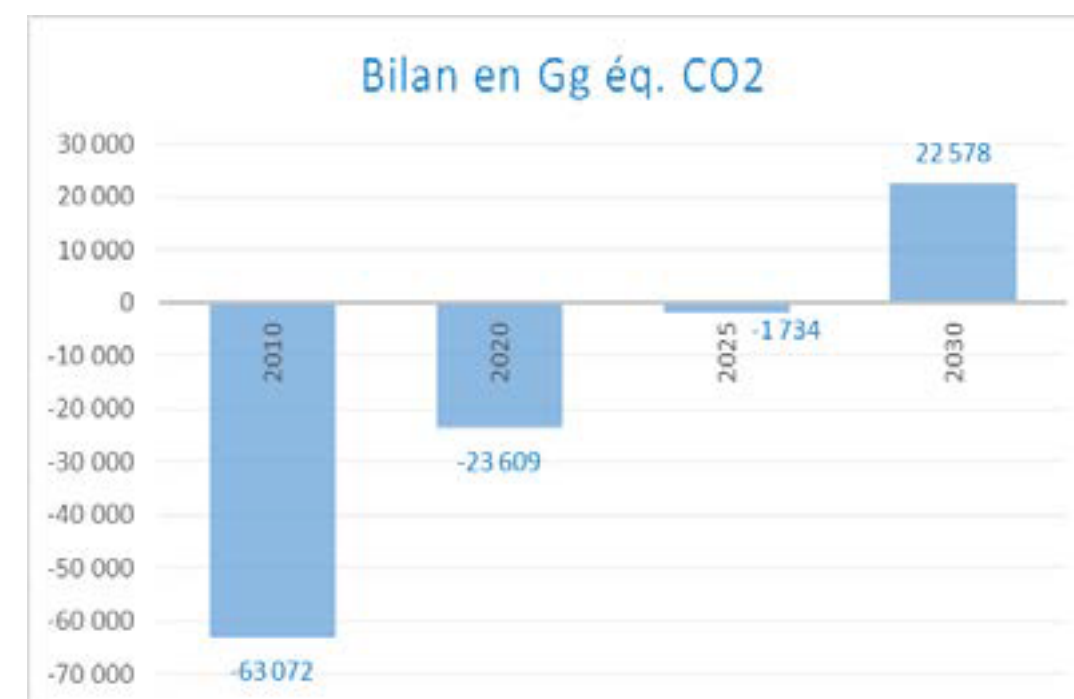


FIGURE 2: TREND IN CARBON SINK STATUS WITHOUT STRENGTHENING MITIGATION ACTIONS

## 2. MITIGATION

Madagascar is still classified as a carbon sink country, hence the importance of this mitigation component. It should be noted, however, that adaptation is the priority for Madagascar given that the country is among the most vulnerable to climate change in the world.

### 2.1 QUANTIFIED NATIONAL CONTRIBUTIONS

By 2030, Madagascar aims to reduce its emissions to 48,403 Gg eq. CO<sub>2</sub>, a decrease of 28% compared to the normal business scenario. In addition to this reduction in emissions, greenhouse gas sinks will be strengthened by 20%, representing avoided emissions, and carbon sinks will be strengthened by 37,809 Gg eq. Land Use, Land Use Change and Forest (LULUCF) sector.

Without strengthening mitigation actions, Madagascar will emerge from its carbon sink status just after the year 2025 when the country will have a balance sheet of -1,734 Gg eq. CO<sub>2</sub> against its status as an absorbing sink -63,072 Gg eq. CO<sub>2</sub> in 2010 and -23,609 Gg CO<sub>2</sub> eq. CO<sub>2</sub> in 2020. By 2030, by omitting mitigation policies and measures in sectoral policies, Madagascar will have a net balance emitting 22,578 Gg eq. CO<sub>2</sub>.

1 The NDC1 normal course scenario projected a balance sheet of 22,095 Gg CO<sub>2</sub> eq in 2030. CO<sub>2</sub> greenhouse gas emissions by 2030. The difference comes from the inclusion of the Industrial Processes and Product Use sector in NDC2.

### 2.2 MITIGATION MEASURES FOR EACH SECTOR (TARGET YEAR: 2030)

#### 2.2.1 CROSS-CUTTING MEASURES

The cross-cutting mitigation measures are:

- Strengthen the institutional capacity of the sector;
- Revitalize inter-ministerial synergy by focusing on indicators for monitoring and evaluation;
- Implementation of an action plan that allows for the implementation, monitoring and evaluation of mitigation measures. This plan will also integrate the application of the MRV emissions, MRV abatements and MRV support tools.

#### 2.2.2 AGRICULTURE

##### 2.2.2.1 GREENHOUSE GAS MITIGATION TARGETS

The most important contributions will be on Cultivated Soils and Rice Cultivation (MIRR, rainfed rice, Integrated Resilient Agriculture Models, improvement of rice production, conservation agriculture and organic farming). In Madagascar, rice cultivation and the expansion of cultivated land are intimately linked.



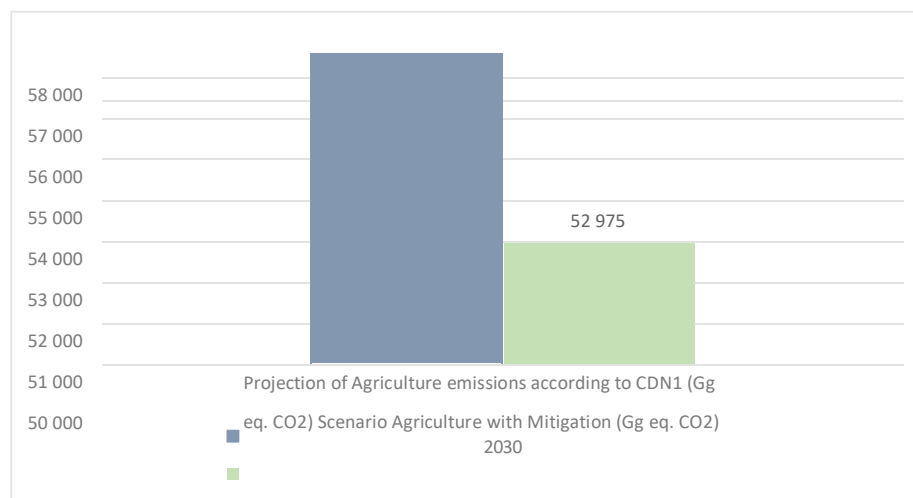


FIGURE 3: COMPARISON OF EMISSIONS, NORMAL COURSE OF BUSINESS SCENARIO AND 2030 MITIGATION SCENARIOS, AGRICULTURE SECTOR

The sector's contribution will be estimated at 4,601 Gg CO2 eq. CO2. The contributions of enteric fermentation in the mitigation of greenhouse gases will gradually increase through the pilot initiatives of integrated cattle breeding.

Emissions that take into account the mitigation actions of the source categories are as follows:

- Cultivated soils: 20,983.4 Gg eq. CO2;
- Enteric fermentation: 15,017.4 Gg eq. CO2;
- Manure management: 11,510.1 Gg eq CO2;
- Rice cultivation: 5,463.5 Gg eq. CO2.

## 2.2.2.2 MITIGATION MEASURES

These mitigation objectives will be achieved by implementing the following measures:

- Facilitate the conditions for the implementation of mitigation actions in the agriculture sector by developing and updating the various technical and legal-institutional frameworks;
- Implement environmentally friendly initiatives such as integrated initiatives and organic farming;
- Scale up agricultural innovations based on new production technologies such as MIAR, Organic Farming, Climate-Smart Agriculture, Agroforestry and Agroecology, while deploying the provision of inputs;
- Establish monitoring and technological capacity-building mechanisms



2.2.3 LAND USE, LAND-USE CHANGE AND FORESTRY (LLUCFA)

2.2.3.1 GREENHOUSE GAS MITIGATION TARGETS

The most important contributions will be on large-scale reforestation (native species, woody species with a socio-economic vocation, mangroves). Contributions from the sector will total - 37,808.6 Gg eq. CO2, which is 63.0% higher than the "normal course of business" scenario.

These contributions are detailed in relation to the sources category above:

- Forest reforestation: -20,232.8 Gg eq. CO2;
- Mangrove restoration: -14,269.3 Gg eq. CO2;
- Degraded natural forest restoration: -2,878.0 Gg CO2 eq. CO2;
- Agroforestry landscape restoration: -428.5 Gg eq. CO2.

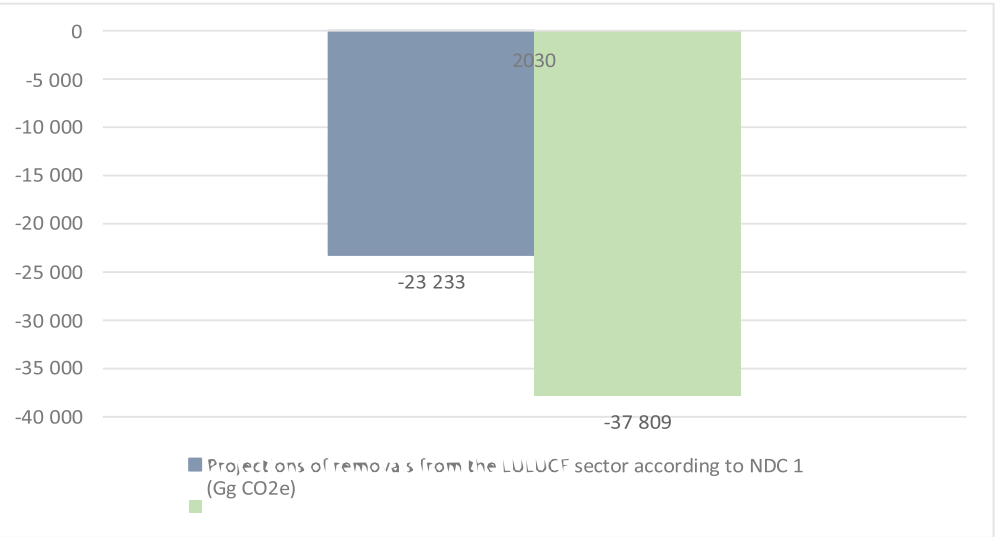


FIGURE 4: COMPARISON OF EMISSIONS PROJECTIONS, NORMAL COURSE SCENARIO, AND MITIGATION SCENARIOS TO 2030, LULUCF

2.2.3.2 MITIGATION MEASURES

The following measures will achieve the objectives estimated above:

- Update the working tools for reducing emissions from the LULUCF sector on the REDD+ strategy and natural resource conservation tools; Raise awareness among stakeholders and build the capacity of stakeholders for the implementation of conservation activities;
- Finalize monitoring tools and operationalize them at the regional level (MRV and information systems);
- Equip equipment for monitoring the reduction of emissions due to changes in land use;

2.2.4 ENERGY

2.2.4.1 GREENHOUSE GAS MITIGATION TARGETS

Emissions from the energy sector come mainly from two source categories: the energy industries subsector, including thermal power plants that make massive use of fossil resources, and the transport subsector. The mitigation potential of the energy sector is 28,030 Gg eq. CO2.

On the other hand, the residential subsector is dominated by wood energy in terms of energy consumption. Indeed, while the majority of biomass-related objectives are accounted for, either in the Forest-Biodiversity sector or in agriculture (LULUCF), on the other hand, biomass intended for cooking (wood energy), which constitutes nearly 92% of the energy balance, is accounted for in the Energy sector (residential sub-sector). The reduction in the consumption of wood energy would lead to a reduction in emissions of around 1,000 Gg eq. until 2030 according to the National Strategy for the Supply of Wood Energy. This leads to the conclusion that the objective of the Energy sector has largely been achieved compared to the NDC1 projection.

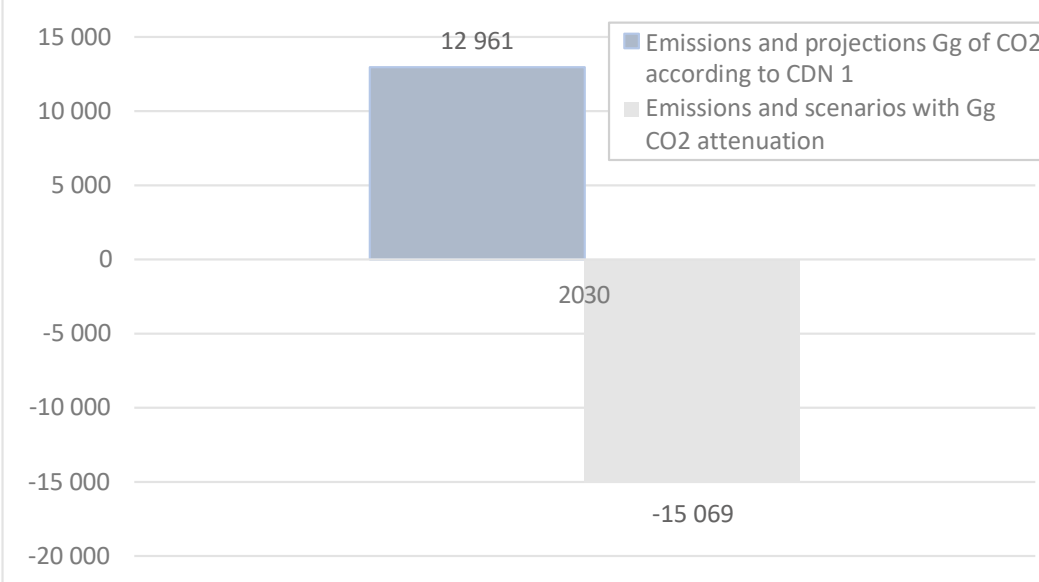


FIGURE 5: COMPARISON OF ISSUANCE, NORMAL COURSE SCENARIO AND THE 2030 MITIGATION SCENARIO, ENERGY SECTOR

2.2.4.2 MITIGATION MEASURES

The Energy sector will move towards an energy transition with a production mix for electricity and lighting using 80% renewable resources by 2030. This mix takes into account energy efficiency with the aim of reducing energy losses in the transmission, distribution and consumption of electricity, in the transformation and energy use of biomass, as well as the reduction of the consumption of petroleum products for electricity production and for commercial and industrial uses. Various measures are planned to mitigate the effects of the production, exploitation and use of energy in its various forms:

- Develop legal and institutional frameworks for reducing emissions from the sector energy, transport and biomass for energy efficiency;
- Update and strengthen frameworks and benchmarks on transport and urban mobility;
- Develop projects and programs that promote green innovations by supporting biodiesel production, developing hydroelectric minigrid projects, moving towards electric cars, and switching to wind and solar power;
- Bringing lower-emission technological innovations in the transport sector including cable transport, Tana tramway;
- Scale up improved cookstove initiatives;
- Setting up capacity building mechanisms on low-carbon technologies (carbon footprint and bioenergy);
- To transfer technology on the various tools, norms and standards on the Climate resilience

2.2.5 RUBBISH

2.2.5.1 GREENHOUSE GAS MITIGATION TARGETS

CDN2 provides for a 51.4% reduction in emissions under the normal course of business scenario of CDN1. Emissions from the sector will be reduced to 1,072 Gg CO2 eq. CO2 (scenario with mitigation) versus 2,083 Gg CO2 eq. CO2 (normal course of business scenario):

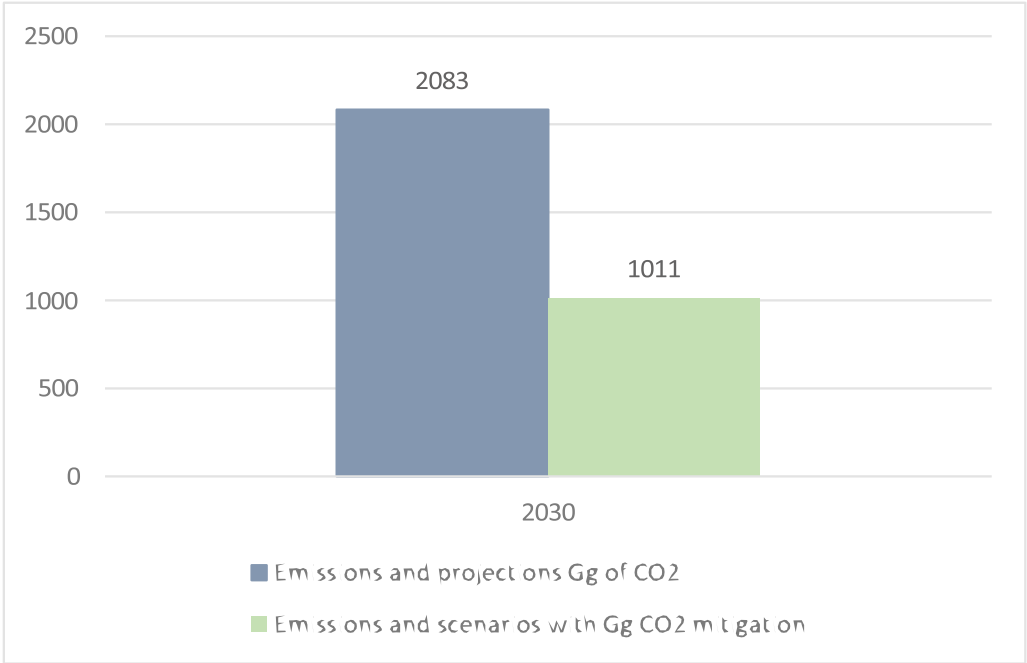


FIGURE 6: COMPARISON OF EMISSIONS PROJECTIONS, NORMAL COURSE SCENARIO, AND MITIGATION SCENARIOS TO 2030, WASTE SECTOR

2.2.5.2 MITIGATION MEASURES

The corresponding mitigation measures are:

- Develop the frameworks of the Waste, Water and Sanitation sector in order to facilitate the implementation of mitigation actions (municipal hygiene code, sanitation master plans, national sanitation program, fiscal measures);
- Update and strengthen frameworks and standards on waste, water and sanitation management;
- Develop and implement innovative projects on waste management by integrating the waste value chain and standardization;
- Support actions in favor of the management of liquid effluents;
- Scale standardized waste recovery initiatives;
- Raise awareness among stakeholders and strengthen the capacities of stakeholders on innovative waste management processes;

- Strengthen the establishment of a reliable data management system at the level of chiefs-places in the regions;
- To transfer technology to innovations in terms of waste treatment;
- Monitor mitigation actions related to waste management by setting up operational structures.

2 NDC1 provided for a scenario with an attenuation of 300 Gg eq. CO2, which would be difficult to achieve, taking into account persistent constraints. These constraints would not ensure optimal operationalization of mitigation measures in the sector.

2.2.6 INDUSTRIAL PROCESSES AND PRODUCT USE

2.2.6.1 GREENHOUSE GAS MITIGATION TARGETS

The sector reduction target is 125 Gg eq. through the reduction of the use of 20% clinker in cement production.

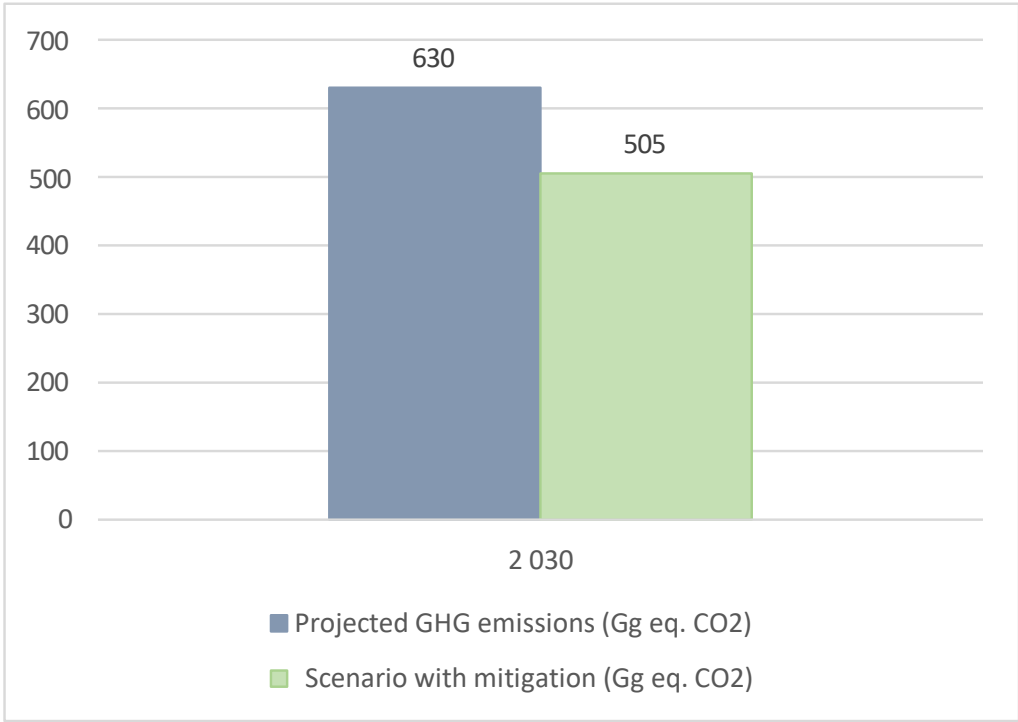


FIGURE 7: COMPARISON OF EMISSION PROJECTIONS, NORMAL COURSE SCENARIOS, AND MITIGATION SCENARIOS TO 2030, INDUCTION PROCESSES AND PRODUCT UTILIZATION SECTOR

2.2.6.2 MITIGATION MEASURES

Although other emitting industries exist, the emissions produced by the cement plant dominate. The following measures make it possible to achieve the above-mentioned sectoral objective:

- Strengthen the legal-institutional frameworks for clinker replacement and use industrial products;
- Support clinker replacement processes;
- Raise awareness among stakeholders about the integration of the environmental process in industries;
- Support the implementation of monitoring tools for the PIUP sector;
- To provide the PIUP sector with equipment for the monitoring of actions;

To conclude, these mitigation measures will lead to reductions in GHG emissions and enhanced removals of carbon sinks. With this in mind, these measures should be integrated and prioritized in sectoral and national programming. Thus, coordination of financial mobilization is necessary and essential for implementation.

Madagascar refers to previous recommendations (DCN 2010, TCN, 2017) recommending the replacement of clinker with 20% fly ash. Projections of cement use take into account population growth and socio-economic growth.

### 3. ACCOMMODATION

#### 3.1 ADAPTATION OBJECTIVES

Madagascar aims to strengthen its national adaptation capacities and reduce climate risks, more particularly by taking into account the following two points:

- All investments will take into account the reduction of climate risks and vulnerabilities
- Human, material and institutional infrastructure is being strengthened, at all levels, to address climate risks.

Adaptation objectives will be achieved through the application of cross-cutting and sectoral measures. In addition, the climate actions in this section will also aim to "strengthen the resilience to climate change of the 32.3 million Malagasy people in 2030".

#### 3.2 ACCOMMODATIONS

##### 3.2.1 CROSS-CUTTING MEASURES

Cross-cutting measures concern several sectors and must be applied in order to achieve adaptation objectives:

- Effectively apply sectoral standards and/or rules already established or established, including climate-resilient infrastructure standards;
- Reinforce Improvement ~~one~~ cyclone early warning systems and scale up multi-hazard early warning systems by integrating phytosanitary surveillance, the agricultural warnings, drought warnings, and food and nutrition monitoring;
- Monitor climate information in real time;
- Develop and update territorial planning and management taking into account the sustainable management of natural resources and adaptation to climate change;
- To implement territorial planning and management taking into account their multisectoral nature;
- Strengthen and apply research findings for all sectors affected by adaptation measures:
- Provision of quantitative data and provision of sustainable solutions against saline infiltration and salinization;
- Promotion of health and climate research;
- Deployment of monitoring and research activities for the agriculture-livestock sector ; improved knowledge of (1) the impacts of temperature increase on food commodities, (2) climatic hazards on factors affecting the sector : animal pests, invasive species, emerging diseases, etc. ; determination of the extent and impacts of water salinization and saline infiltration on crop plots; promotion of scientific research and its application to the development of livestock farming in Madagascar;
- Research and innovations on agrobiodiversity.

##### 3.2.2 AGRICULTURE - LIVESTOCK

The national economy depends on the agricultural sector, it represents 24.1% of GDP. However, this sector is among the most vulnerable to climate change. The measures taken with regard to agriculture mentioned below are in line with the (i) MSP in its commitment n°1 and n°2 aimed at food self-sufficiency, (ii) the revised National Policy to Combat Climate Change (PNLCCr) in its strategic axis 2 on strengthening adaptation and reducing vulnerability, as well as with (iii) programs n°1 and 2 of the National Adaptation Plan which aims at the resilience of agrosystems and the adaptation of Agricultural and livestock practices in climatic conditions

- Strengthen strategic frameworks, management schemes and knowledge bases on vulnerability and responses to climate change (cross-sectoral foresight);
- Facilitate access to means of implementation, particularly in relation to agricultural credit and agricultural insurance;
- Promotion of resilient practices on the livestock system, on the modernization of agricultural production systems and on the use of Agricultural Emergence Zones;
- Implementation of standards (agricultural infrastructure) and implementation plans;
- Capacity building on innovative sustainable agriculture techniques and strengthening the resilience of livestock (including breed improvement/conservation);
- Development of monitoring and early warning systems specifically on salinization and



### 3.2.3 WATER RESOURCES

Water availability is likely to decrease with global warming. Integrated water resources management and water resources planning are essential to ensure the sustainability of water resources. The measures taken in the framework of this document are aligned with (i) the PEM in its commitment n°9 on Energy and Water for All, (ii) the revised PNLCC in its strategic axis 2 on the strengthening of adaptation actions, and on the (iii) NAP through the structuring program n° 4 "Improving access to drinking water in urban and rural areas"

The measures to be implemented for water resources are as follows:

- Strengthen strategic frameworks, management schemes and knowledge bases on vulnerability and responses to climate change;
- Facilitate access to means of implementation by investing in water management (production and food);
- Strengthen the governance of infrastructure and management systems and support the effectiveness of integrated water resources management;
- Promotion of resilient practices and sustainable resource development;
- Implementation of standards and implementation plans (sanitation and drinking water infrastructure);
- Capacity building (institutional and technical).
- Update databases and strengthen monitoring and early warning systems

### 3.2.4 FORESTS AND BIODIVERSITY

Land degradation and the loss of biodiversity linked to the adverse effects of climate change are a threat to Madagascar. The measures taken in NDC2 for the forest and biodiversity sector aim to reduce the vulnerability of ecosystems on the one hand and to find a synergy between conservation and climate change mitigation on the other. These measures are aligned with (i) the PEM through commitment n°13 on the sustainable management and conservation of our natural resources, (ii) the revised PNLCC through strategic axis 1 on strengthening mitigation contributions in coherence with sustainable development, and axis 2 on strengthening adaptation actions, (iii) the National Adaptation Plan through program 6 on the acceleration of reforestation through the operationalization of the mechanism REDD+ and the Development of Ecosystem Services, and Programme 7 on Enhancing the Conservation of Natural Forests and Protected Areas Management

The measures to be taken for this sector are presented below:

- Strengthen strategic frameworks on the large-scale development of forest phylogenetic resource value chains, as well as management schemes and knowledge bases on vulnerability and responses to climate change;
- Facilitate the means of implementation, strengthen the conditions conducive to investments in equitable value chains as well as private investment in forest management actions;
- Strengthen infrastructure governance, management systems, in-situ and ex situ conservation of threatened species
- Promotion of resilient practices, sustainable development of resources, strengthening the resilience of natural ecosystems and ecosystem services through reforestation and restoration;
- Establish an ecosystem-based adaptation process;
- Strengthening databases and updating data on harmful and invasive species on the geographical distribution of biota by identifying priority areas for conservation;
- Development of monitoring and early warning systems

### 3.2.5 PUBLIC HEALTH

Diseases linked to the rise in temperature are increasing in Madagascar. The actions taken in this document for the health sector are aimed at addressing the main needs of the health sector with regard to the need to strengthen investments to strengthen health infrastructure, and the reduction of vulnerability to climate-sensitive diseases. These measures are aligned with (i) the MSP through Commitment No. 5 stipulating that health is an inalienable right for every citizen, (ii) the revised NCCP through Strategic Axis No. 2 on Strengthening Adaptation, and the (iii) NAP through Program No. 5 on Strengthening Early Warning Systems for the Resilience of the Health Sector to Climate Change.

The measures specified for this sector are listed below:

- Strengthen strategic frameworks, management schemes and knowledge bases on vulnerability and responses to climate change;
- Promotion of resilient practices, intensification of interventions to health responses to climate-sensitive diseases, and standardization of health infrastructure infrastructure, medical waste management infrastructure;
- Strengthen the capacities of the health system and actors in terms of adaptation to climate change and integrate the Health and Climate Change theme into the research agenda of institutions;
- Update databases and develop monitoring and evaluation mechanisms in terms of climate health;
- Development of monitoring and early warning systems.

### 3.2.6 COASTAL AREAS

Rising sea levels and the retreat of coastlines due to climate change are already affecting the population living in coastal areas. The actions included in this NDC2 aim at integrated coastal zone management, reduction of coastal environmental degradation, and sustainable development. These measures align with (i) the MSP through Commitment No. 13 on the sustainable management and conservation of our natural resources, and Commitment No. 11 on the tourism industry, the revised NCCP through Axis 2 on building resilience, and the NAP through Program 8 on the protection of coastal infrastructure and economic activities.

Adaptation measures for this sector include:

- Strengthen strategic frameworks, management schemes and knowledge bases on vulnerability and responses to climate change;
- Promotion of resilient practices, sustainable resource development, and strengthening of the protection of coastal and coastal infrastructure and economic activities;
- Strengthening of technical, institutional and operational capacities on integrated coastal zone management;
- Update databases and information systems on climatic hazards and impacts on urban agglomerations, agricultural and fisheries production areas

- Development of monitoring and early warning systems, strengthening restoration plans, connectivity of habitats of coastal, coastal and marine ecosystems;
- Tripling of the surface area of marine protected areas, scaling up of conservation and sustainable participatory management of coastal and coastal resources, strengthening of natural protection and reduction of the vulnerability of coastal, marine and coastal areas affected by coastal erosion and coastal retreat

### 3.2.7 SPATIAL PLANNING

As part of the implementation of the "Modernization of Madagascar", measures to adapt cities to climate change are planned. The costing was made according to the budgeting established by the following budget lines of the Secretary of State in charge of New Cities and Housing or in relation to the prospective studies that have already been carried out.

The actions to be taken will be in relation to the integration of the establishment of the new city with national efforts to adapt to climate change as a resilient city developed with zero carbon. In fact, it is a question of making territorial development plans in accordance with adaptation to climatic hazards and releasing the least amount of carbon (Zero Carbon).

### 3.2.8 RISKS AND DISASTERS

The measures to be taken into account in terms of risks and disasters are as follows:

- Strengthen strategic frameworks, management schemes and knowledge bases on vulnerability and responses to climate change;
- Facilitate access to means of implementation;
- Strengthen the governance of infrastructure and management systems;
- Promotion of resilient practices and sustainable resource development;
- Implementation of standards and implementation plans.

In conclusion, these adaptation measures will reduce vulnerability and strengthen the country's resilience. Indeed, the implementation of the NAP will contribute to the achievement of the objectives of the NDC. These measures should be integrated and prioritized in sectoral and national programming. Thus, coordination of financial mobilization is necessary and essential for implementation.

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## 4. MEANS OF IMPLEMENTATION

Madagascar, as a country that is highly vulnerable to climate hazards, allocates a substantial portion of its annual budget to infrastructure and social service arrangements to help address the adverse effects of climate change. Since the country submitted its National Action Paper on Appropriate Mitigation in 2011, actions to reduce GHG emissions and strengthen carbon sinks are increasingly considered an integral part of the country's sustainable development actions.

### 4.1 GAPS AND BARRIERS

Madagascar has no historical responsibility for greenhouse gas emissions and their impacts. The country is currently in the process of losing its status as a greenhouse gas sink; but at the same time, Madagascar is a country with a weak economic and social situation. From the above, most of the means of implementation of the NDC2 will depend on the availability of external financial resources, capacity-building actions and the transfer of innovative technologies from developed or developing countries able to provide support in the fight against climate change.

Barriers to the implementation of the Republic of Madagascar's NDC2 adaptation and mitigation activities include, but are not limited to:

- Weak capacities (knowledge, techniques, technology, resource mobilization);
- The lack of capacity for the development and mobilization of climate technologies Smart;
- The low consideration of gender, climate empowerment and the low participation of all actors;
- The lack of resources for the development of framework documents, standards and standards.

### 4.2 CAPACITY BUILDING

Human resources potential exist within the various structures involved in the implementation of actions to combat climate change. These executives need an upgrade to properly perform their roles. Capacity building essentially concerns the mastery of new tools and methods in terms of programming, leadership, monitoring and evaluation, resource mobilization as well as the provision of work materials and equipment. All these capacity-building actions are recommended by the Revised National Policy to Combat Climate Change (PNCCR). Priority capacity-building actions include:

- Periodic assessment of national capacity-building needs;
- Strengthening of the national coordination structure for greenhouse gas inventories, planning and programming of mitigation projects;
- Accounting for emissions and emission reductions, through development country-specific emission factors and the improvement of the national GHG inventory;
- Identifying and updating needs for reducing climate risks and vulnerabilities and strengthening national mitigation potential;
- Involvement of national, subnational and local actors in the monitoring of climate parameters, assessment of climate risks and vulnerabilities, assessment of mitigation potential and collection of sectoral scientific data.



### 4.3 TECHNOLOGY TRANSFER

Madagascar carried out its technology needs assessment in 2018. Technologies to combat climate change are available in Madagascar and some are developed at the national level (MIRR, SRI, SRA, agroforestry techniques, improved stoves, adapted crop varieties) through national research centres and universities. The development of endogenous technologies that adapt to the national context and are easy to disseminate will be more in line with the recommendations of the PNCCR. In addition, the introduction of new innovative technologies developed outside the country will be leveraged through the development of win-win North-South, South-South, or tripartite (North-South-national) partnerships. The country's immediate needs in terms of technology transfer are:

- Identification and capitalization of techniques, technologies and best practices in the development of mitigation technologies resulting from national research and development;
- In-depth assessment of traditional and local knowledge that can contribute to climate risk reduction, greenhouse gas reduction and strengthening carbon sinks;
- Strengthening the establishment of the national system for sharing technical and operational knowledge, contributing to the development of collaboration and capacity building facilitating the adoption and promotion of innovative and transformative mitigation technologies with tangible impacts;
- The establishment of a monitoring and evaluation mechanism to learn more about the costs, results, and planning and management process of resources allocated to climate technologies.

### 4.4 GENDER CONSIDERATION, CLIMATE EMPOWERMENT AND PARTICIPATION AT ALL LEVELS

Madagascar aims to strengthen national capacities and mobilize more resources to consider respecting, promoting and taking into account its obligations regarding

human rights, the right to health, the rights of indigenous peoples, local communities, migrants, children, persons with disabilities and persons in vulnerable situations, the right to development, as well as gender equality and intergenerational equity.

The roles of women and the poorest as agents of change within households need to be strengthened in the choice and promotion of adaptation and mitigation measures and technologies (through the promotion of less emitting cooking and lighting energy, or the adoption of short-cycle varieties, etc.). Madagascar will be actively involved in international gender mainstreaming efforts, including the Paris Agreement's Action Plan for Women's Empowerment and Gender Equality.

Madagascar has developed efforts by structures, and has developed strategic frameworks to strengthen education, training and access to information. However, it is important to note that the following elements are largely insufficient:

- The development and implementation of public education and awareness programmes;
- Public access to information;
- Public participation in evaluation climate challenges and measures;
- Training of scientific staff, technical and managerial skills;
- Cooperation and exchange of experiences with a view to developing educational and awareness-raising materials.

In its implementation, the NDC2 also aims to develop an information network and strengthen the participation of all actors: decision-makers, government institutions and agencies, cities, non-governmental organizations, civil society, the private sector, the media, research institutions and local communities.

4.5 LOSS DAMAGE

4.5.1 IMPACT OF HAZARDS

4.5.1.1 CYCLONES AND FLOODS

- Between 2007 and 2020:
  - 52 dead, 50 missing per year (58 deaths per year according to United Nations data published in 2020); 172,000 victims per hurricane season over the last 10 years;
  - 50,000 housing huts destroyed per year;
  - 100,000 ha of agricultural plots destroyed per year;
- Landslides and landslides, slowing down of road transport to the point of impassability on provincial and regional roads, slowing down of socio-economic exchanges, inflation, social conflicts;
- Inability to operate airport infrastructure for up to several days and economic losses;
- Impassability of rail transport networks, social impacts caused by landlocked status and economic losses;
- Cyclone loss index: 4.5 to 5 between 2007-2020 (targets: 4 in 2020 according to NDC1);

4.5.1.2 DROUGHT

The food insecurity rate is 75.9% in Atsimo Andrefana, 63.4% in Androy and 53.4% in Anosy, the impact of the drought is currently becoming more and more severe, about 1.64 million people (37% of the population of the Great South) are in high acute food insecurity, including more than 400,000 (9% of the population analyzed) in IPC Phase 4 (Emergency).

It is recommended to provide support for adapted cultivation techniques with agricultural inputs for the start of the major season. Assistance to strengthen livelihoods is recommended, especially for households in a phase of very severe insecurity.

4.5.2 VULNERABILITY

- Limited capacity to anticipate and respond to climate disasters, despite the implementation of early warning systems (EWS): 27 observation stations (synoptic and hydrological) by participating in climate and agrometeorological monitoring in 2017;
- Policies not clearly defined, institutional capacity insufficient and lack of coordination: compartmentalization of interventions (separate institutions in charge of cyclone hazards, tsunamis, flooding of the capital, and food insecurity);
- Insufficient means for the operationalization of national standards developed to limit socio-economic losses;
- Loss and Damage Strategy (sustainable financing mechanism including an emergency fund and a compensation fund, emergency response mechanisms, strengthening of the crisis management capabilities, etc.) undeveloped;
- Only three disaster risk management operational centers;
- Early warning system covering only a few hazards (cyclones, floods, food insecurity in the south, flooding in the capital). Other climatic hazards not covered: food and nutritional insecurity (national), droughts, sanitary and phytosanitary surveillance;
- Lack of capacity for the expansion and continuity of early warning systems.

4.5.3 OBJECTIVES AND DEVELOPMENT ACTIONS

- Develop multi-hazard early warning systems with priority given to cyclones, floods, drought, sanitary and phytosanitary surveillance;
- Strengthen and update multi-hazard early warning systems by integrating pest surveillance, agricultural warnings, drought warnings, and food and nutrition surveillance;
- Reduce the cyclone loss index to 3 by 2030 through effective implementation of infrastructure standards and/or sectoral rules already established or initiated.

4.6 FINANCIAL SUPPORT

The costing of NDC2 was based on the needs already identified in the NAP, the SOUTH PEM and the ongoing PEM. Given that the NDC has been revised to raise national ambition for adaptation and mitigation, the costs associated with its implementation are estimated at USD 23.906 billion, broken down in the table

1. In order to demonstrate its commitment to climate change, the Republic of Madagascar will contribute with internal resources (own resources, private sector, environmental funds and foundations, non-governmental organizations and associations, etc.) to the implementation of the actions of the INDC to the tune of 3 to 4% of the indicated costs, i.e. approximately USD 700 million to USD 900 million by 2030. Nationally Determined Contributions will be in the form of co-financing of programmes and projects arising from the implementation of adaptation and mitigation measures, tax exemptions (renewable energy supplies, sustainable fertilizer production equipment, improved breeds and varieties, etc.) and an increase in the share of domestic financing (operations and investments) in the public sectors concerned with adaptation and mitigation. Madagascar would therefore need to mobilize financial resources to achieve these emission reduction targets and strengthen the country's resilience. States are encouraged to be ambitious in their actions and developing countries such as Madagascar should benefit from substantial funding. It should be noted that these amounts, which amount to USD 24.406 billion, are estimates. The costs are spread over a period of 10 years and must be reassessed every 5 years.

Table 1: Estimated costs of implementing NDC2 (2022-2030)

Activities	Estimated amount (USD)	Estimated amount (in billions of USD)
Implementation of climate actions	18 915 335 822	18,915
Attenuation	7 290 253 612	7,290
Adaptation	11 625 082 210	11,625
Coordination	1 267 327 500	1,267
Institutional capacity building	680 952 090	0,681
Monitoring and evaluation	662 036 754	0,662
Technology transfer	61 474 841	0,061
Gender, climate empowerment	18 915 336	0,019
Loss and Damage	2 800 000 000	2,800
TOTAL CDN2 COST	24 406 042 343	24,406

## 5. INSTITUTIONAL ARRANGEMENT FOR IMPLEMENTATION

### 5.1 HIGH-LEVEL STRATEGIC COORDINATION

The implementation of NDC2 will be carried out through a Budgeted Implementation Plan. A simplified representation of the institutional arrangement given in Figure 7, and the main institutions involved in the implementation of NDC2 are given in Table 2.

The Government, under the authority of the President of the Republic and the diligence of the Head of Government, constitute the strategic coordination body. These institutions are responsible for the development of the General State Policy and high-level arbitration. The Ministry in charge of Planning is responsible for the coordination of the National Development Plan, which transcribes the implementation of the General State Policy into five-year multi-year programmes.

The implementation of these programs is part of the Finance Laws on an annual basis, the validation of which must go through the two parliamentary chambers, the National Assembly and the Senate. The operationalization of the NDC2 Implementation Plan will be done under the aegis of a Steering Committee, which will include government representations, representatives of the entities involved in the implementation of the NDC2, as well as representatives of the National Committee on Climate Change (CNSC).

### 5.2 NATIONAL OPERATIONAL COORDINATION

The Ministry of Environment and Sustainable Development (MEDD), through the BNCCREDD+, is responsible for developing the budgeted and spatialized implementation plan for the NDC2. The adoption of this plan will not take place more than three months after the adoption of the NDC2.

The MEDD has been mandated by the Government of Madagascar to coordinate the operationalization of climate actions. The MEDD is also responsible for consolidating national inventories of GHGs and the impacts of climate hazards, as well as for the implementation of measures carried out by the Government and other institutions involved in the implementation of climate actions. The MESD is responsible for reporting (of these GHG emission situations, climate risk and vulnerability situations, and related achievements) to the UNFCCC Secretariat. The achievement of these various responsibilities of the MEDD is carried out through the operationalization of the national and sectoral MRV systems that have recently been developed. This MRV system was set up in partnership with Conservation International, and in collaboration with the various ministerial institutions involved in climate action. It was funded by the Capacity Building Initiative for the Transparency of the Paris Agreement (CBIT). It should be noted, however, that the full operationalization of national and sectoral MRV systems still requires regulatory frameworks that should guarantee its continuous supply of information.

Periodic meetings of CNSC members will be held to monitor the achievements of climate actions within each department concerned with adaptation and mitigation. The CNSC was established in 2014 by Decree no. 2014-1588. It is a structure for sharing information and experiences, as well as for dialogue and consultation, chaired by the Secretary General of the Ministry of the Environment. It is composed of members appointed on the proposal of the ministers of the sectoral departments and representatives of other actors in the protection of the environment and the fight against climate change. Among its responsibilities are, among other things, the proposal of measures or orientations likely to strengthen the fight against climate change. As part of NDC2, the CNSC was consulted during its development. She will also be part of the steering committee for its implementation. The NBCC serves as the secretary of the CNSC.

The minutes of the CNSC's periodic meetings, consolidated by the MESD, will be sent to the member of the NDC2 Implementation Steering Committee for their validation. The minutes thus validated will feed the information that goes up to the highest level of the Government.

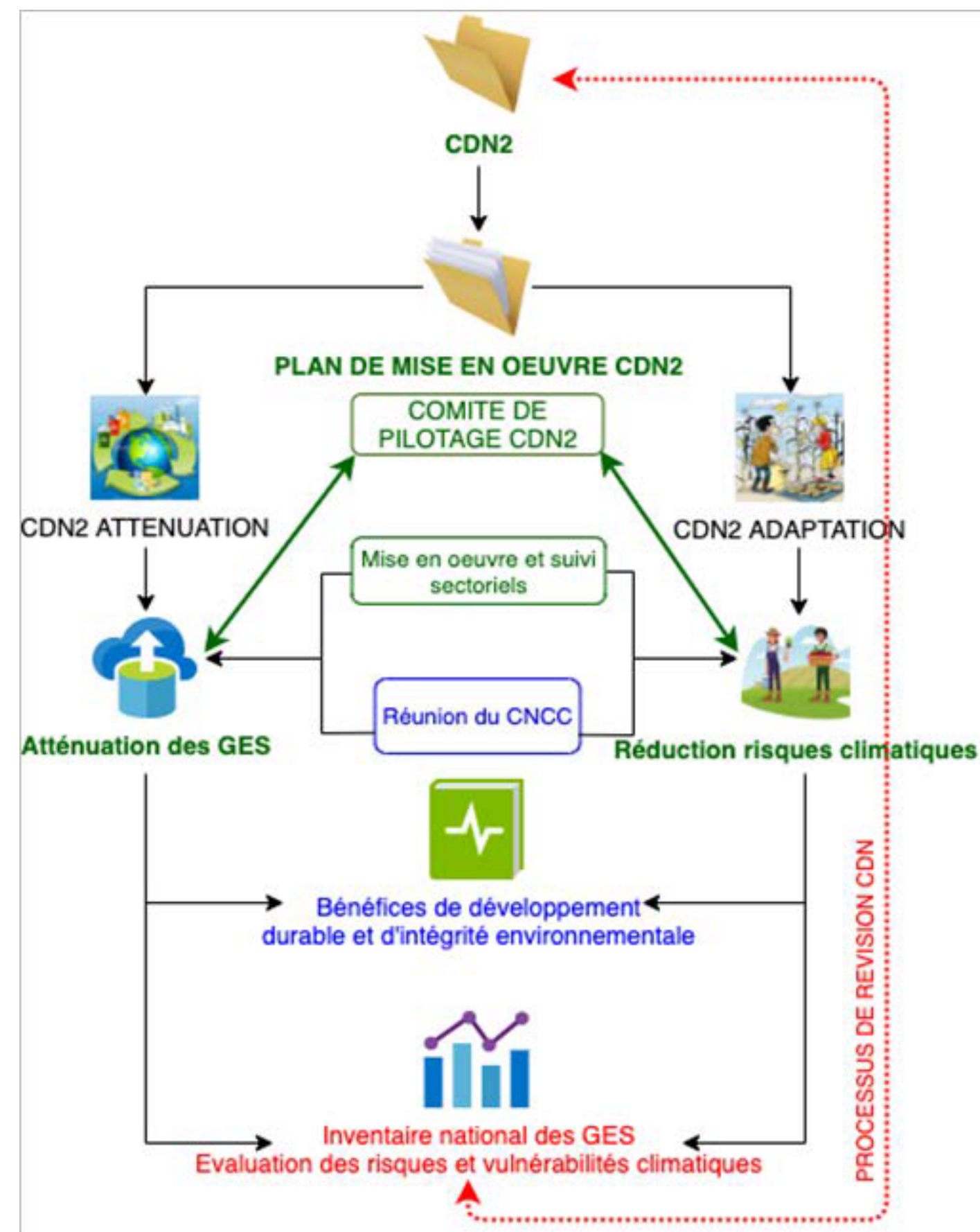


FIGURE 8: INSTITUTIONAL ARRANGEMENT FOR THE IMPLEMENTATION OF THE NDC2



5.3 COORDINATION AND IMPLEMENTATION OF CLIMATE ACTIONS IN THE MITIGATION AND ADAPTATION SECTORS

For climate actions, the list of key institutions involved in each Mitigation and adaptation sector is given in Table 2. It should be mentioned that each Ministerial Department is responsible for the development of their Medium-Term Expenditure Framework, which is annually transcribed into the Annual Work Plan of each Ministry. In order to coordinate the interventions of the actors in Table 2:

- More revisions, harmonization or development of legal frameworks are needed to ensure that climate action is effectively implemented;
- The Ministry of the Environment is responsible for coordinating the development of the NDC2 implementation plan. For all the sectors mentioned in Table 2, the Environment Administration (including the governance of protected areas and ecosystems) appears to be a major player in climate actions, thus supporting the role of the MESD in the operational coordination of actions to combat climate change. Similarly for adaptation actions on climate loss and damage in paragraph 3.6;
- For both mitigation and adaptation sectors, sustainable management of natural ecosystems, and management integrated water resources are emerging as major actions that are essential to national efforts to combat climate change, in particular covering hydraulics and sanitation, the protection of watersheds and natural ecosystems essential for energy production and resilience

climate, etc. The Ministry of the Environment, working closely with the institutions involved in the sustainable management of natural ecosystems and IWRM, including the Land and Territory Administration, the Water and Sanitation Administration, the Energy Administration, the Public Works and Transport Administration, will carry out prospective analyses on the sustainable management of natural ecosystems and the integrated management of water resources, in conjunction with the NDC2 and its implementation plan;

- The spatialization of climate actions requires the increased involvement of the Land Administration and the territory, through:
  - o The development of regional land use plans, which should serve as a reference for land use planning and large-scale actions such as the reforestation of mangroves and other woody species;
  - o Facilitating access to land for the modernization of agricultural production systems;
  - o Securing protected areas and natural ecosystems that are crucial for maintaining and strengthening Provision of ecosystem services;
- The spatialization of climate actions requires the increased involvement of the Land Administration and the territory, through:
  - o The development of regional land use plans, which should serve as a reference for land use planning and large-scale actions such as the reforestation of mangroves and other woody species;

- o Facilitating access to land for the modernization of agricultural production systems;
- o Securing protected areas and natural ecosystems that are crucial for maintaining and enhancing ecosystem services;
- The jurisdictional institutions (bringing together the Decentralised Technical Services, Decentralised Local Authorities) are involved in the effective implementation of actions at the Jurisdictional. These institutions have needs crucial capacities and means;
- The cross-cutting actors are responsible for supporting the sectoral departments and the Ministry of the Environment in achieving the objectives of the NDC2:
  - o The Ministry of Finance and Budget, through the coordination of budget conferences, guarantees the inclusion of actions programmatic measures to combat climate change on the annual Finance Laws. These programmatic actions stem from the medium-term expenditure frameworks of each Ministry;
  - o The Ministry of Public Works, the Ministry of Transport, the National Bureau of Disaster Risk Management (BNGRC), the Ministry of National Defence and the Ministry of National Defence of the population are involved in emergency management, during climatic disasters, particularly during cyclones and floods;
  - o The BNGRC, the Emergency Prevention and Management Unit, the Ministry in charge of Meteorology, in collaboration with the ministerial departments concerned (including the Ministry in charge of

water, the Ministry of Agriculture, the Ministry of Public Health, the Ministry of Trade, etc.) are responsible for expediting the development and strengthening of early warning systems;

- o The Ministry of Higher Education and Scientific Research is responsible for developing knowledge, techniques and technologies endogenous or adapted to the endogenous context, contributing to the achievement of the objectives of the NDC2. It is also responsible for transmitting this knowledge, techniques and technologies to the executives of the institutions responsible for the implementation of actions to combat climate change;

- o Other institutions, including specialized bodies attached to ministries and civil society organizations, are participating in the achievement of the objectives of the NDC2 through the provision of data and information, and by facilitating socio-economic transformations, including gender mainstreaming, contributing to the reduction of climate risks and greenhouse gas emissions. These institutions may be specific to adaptation or mitigation sectors, or actors participating in a way that (see Table 2).

Details on the roles and responsibilities of technical and financial partners should accompany the implementation plan, so that achievements do not deviate from expected results. Technical and financial partners include bilateral and multilateral partners, non-governmental organizations, associations and cooperatives, etc.



	MITIGATION		ADAPTATION		TRANSVERSE
<p><b><u>STRATEGIC COORDINATION:</u></b></p> <ul style="list-style-type: none"> <li>- Government (high-level arbitration and prioritization)</li> <li>- Ministry in charge of Planning (planning coordination strategy)</li> <li>- Parliaments</li> </ul> <p><b><u>OPERATIONAL COORDINATION:</u></b></p> <p><b>Ministry of Environment and Sustainable Development:</b></p> <ul style="list-style-type: none"> <li>- Coordination of implementation;</li> <li>- Consolidation of achievements</li> </ul> <p><b>National Climate Change Committee:</b></p> <ul style="list-style-type: none"> <li>- Information sharing, dialogue</li> <li>- Proposal for Likely Guidance strengthen climate action</li> </ul>	<p><b><u>Agriculture and LULUCAF:</u></b></p> <ul style="list-style-type: none"> <li>- Institutions of legal frameworks</li> <li>- Forestry Administration</li> <li>- Land and land use planning</li> <li>- IWRM Governance</li> </ul>	<ul style="list-style-type: none"> <li>- Jurisdictional institutions (STD, CPC)</li> <li>- Technical partners and Financial</li> <li>- Civil society organization (sectoral, gender, etc.)</li> </ul>	<p><b><u>Agriculture</u></b></p> <ul style="list-style-type: none"> <li>- Institutions of legal frameworks</li> <li>- Agriculture-Livestock-Fisheries Administration</li> <li>- Environmental Administration</li> <li>- Forestry Administration</li> <li>- Industry Administration</li> <li>- Trade Administration</li> <li>- Protected Area Governance</li> <li>- Land and land use planning</li> <li>- IWRM Governance</li> </ul>	<ul style="list-style-type: none"> <li>- Jurisdictional institutions (STD, CPC)</li> <li>- Technical partners and financial</li> <li>- Civil society organization (sectoral, gender, etc.)</li> <li>- Value Chain Development Organizations (CDBAs)</li> </ul>	<ul style="list-style-type: none"> <li>- Department v. Finance and Budget (coordination of investments)</li> <li>- Department v. Public Works</li> <li>- Department v. Transport</li> <li>- Department v. Meteorology</li> <li>- Ministry of Higher Education and Scientific Research</li> <li>- Ministry v. National Education</li> <li>- Department v. Population</li> <li>- Department of National Defence</li> <li>- National Office of Risk and Disaster Management (BNGRC)</li> <li>- Emergency Prevention and Management Unit (CPGU)</li> <li>- National Institute of Cartography (FTM)</li> <li>- National Institute of Statistics</li> <li>- National Office of Environment (c. = loaded)</li> </ul>
	<p><b><u>Energy:</u></b></p> <ul style="list-style-type: none"> <li>- Institutions of legal frameworks</li> <li>- Energy, Transportation and Transportation Administration</li> <li>- and hydrocarbons</li> <li>- Forestry Administration and Environmental</li> <li>- Land and land use planning</li> </ul>	<ul style="list-style-type: none"> <li>- IWRM Governance</li> <li>- Jurisdictional institutions (STD, CPC)</li> <li>- Technical partners and Financial</li> <li>- Private Sectors</li> </ul>	<p><b><u>Water Resources</u></b></p> <ul style="list-style-type: none"> <li>- Institutions of legal frameworks</li> <li>- IWRM Governance</li> <li>- Agriculture-Livestock Administration</li> <li>- Environmental Administration and Forest</li> <li>- Land and Land Administration</li> <li>- Industry Administration</li> <li>- Protected Area Governance</li> </ul>	<ul style="list-style-type: none"> <li>- Jurisdictional institutions (STD, CPC)</li> <li>- Technical partners and Financial</li> <li>- Private sector</li> <li>- Civil society organization (sectoral, gender, etc.)</li> </ul>	
	<p><b><u>Rubbish:</u></b></p> <ul style="list-style-type: none"> <li>- Institutions of legal frameworks</li> <li>- Environmental Administration</li> <li>- Water Administration and sanitation</li> <li>- Land and land use planning</li> <li>- Industrial Administration</li> <li>- Administration of crafts (circular economy)</li> <li>- IWRM Governance</li> </ul>	<ul style="list-style-type: none"> <li>- Civil society organization (sectoral, farmers' associations, gender, etc.)</li> <li>- Facilitating bodies (EDBM)</li> <li>- Jurisdictional institutions (STD, CPC)</li> <li>- Technical partners and Financial</li> <li>- Civil society organization (sectoral, cooperatives, gender, etc.)</li> </ul>	<p><b><u>Public health</u></b></p> <ul style="list-style-type: none"> <li>- Institutions of legal frameworks</li> <li>- Public Health Administration</li> <li>- IWRM Governance</li> <li>- Agriculture-Livestock Administration</li> <li>- Environmental Administration</li> <li>- Industry Administration</li> </ul>	<ul style="list-style-type: none"> <li>- Jurisdictional institutions (STD, CPC)</li> <li>- Technical partners and Financial</li> <li>- Civil society organization (sectoral, gender, etc.)</li> </ul>	
	<p><b><u>PIUP:</u></b></p> <ul style="list-style-type: none"> <li>- Institutions of legal frameworks</li> <li>- Environmental Administration</li> <li>- Industrial Administration</li> <li>- Trade Administration</li> <li>- IWRM Governance</li> </ul>	<ul style="list-style-type: none"> <li>- Civil society organization (sectoral, gender, etc.)</li> <li>- Jurisdictional institutions (STD, CPC)</li> <li>- Technical partners and Financial</li> <li>- Civil society organization (sectoral, gender, etc.)</li> </ul>	<p><b><u>Coastal areas</u></b></p> <ul style="list-style-type: none"> <li>- Institutions of legal frameworks</li> <li>- National and Regional Committees of the ICZM</li> <li>- IWRM Governance</li> <li>- Protected Areas Administration</li> <li>- Administration Agriculture-Livestock-Fisheries</li> <li>- Environmental Administration</li> </ul>	<ul style="list-style-type: none"> <li>- Land Administration and the territory</li> <li>- Industry Administration</li> <li>- Jurisdictional institutions (STD, CPC)</li> <li>- Technical partners and financial</li> <li>- Civil society organization (sectoral, gender, etc.)</li> </ul>	

TABLE 2: LIST OF KEY ACTORS INVOLVED IN THE IMPLEMENTATION OF CLIMATE ACTIONS AT THE MADAGASCAR NDC2

## 6. APPENDICES

## 6.1 ANNEX 1: KEY REFERENCES FOR THE DEVELOPMENT AND IMPLEMENTATION OF NDC2

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Framework Convention on the	United Nations Climate Change Initiative.
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Convention	United Nations Climate Change Initiative. Ministry of Environment and Forests.
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Repoblikan'i Madagasikara. 2013.	Decree No. 2013685 on the adoption of the National Water Strategy, Sanitation and Hygiene. Ministry of Water.
Repoblikan'i Madagasikara. 2014.	National capacity self-assessment: final report and action plan. Ministry of the Environment, Ecology and Forests.
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Repoblikan'i Madagasikara. 2015.	Intended Nationally Determined Contribution (INDC).
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## 6.2 ANNEX 2: CLARITY INFORMATION, TRANSPARENCY AND UNDERSTANDING

### 6.2.1 REFERENCE POINT

The base year for emissions is 2010, coinciding with the last greenhouse gas inventory published in the Third National Communication, revised when the NDC1 was drafted. The base year for mitigation targets, using the "Business as usual" scenario, is 2030. Emissions projections for the year 2025 are given for the revision of the NDC starting this year. In 2030, the net balance of emissions and removals is projected at 22 578 Gg eq. CO2.

### 6.2.2 SOURCE INFORMATION DATA USED TO QUANTIFY THE REFERENCE POINT(S)

The analyses and projections presented are based on the results of the inventories from the years 2000 to 2010 compiled in the three National Communications. The results for the years 2000, 2005 and 2010 were revisited during the development of Madagascar's Nationally Determined Contribution (NDC1), and it is these revised results that are presented here.

### 6.2.3 IMPLEMENTATION PERIODS

The NDC2 will be implemented from the date of submission until 2030. The accounting for its implementation will, however, cover activities already started since 2021, in accordance with NDC1.



6.2.4 SCOPE AND COVERAGE

TABLE 3: SECTORS AND SOURCE CATEGORIES AFFECTED BY MITIGATION

SECTORS	SOURCES
Energy	Energy, biomass, transport industries
Agriculture	Enteric fermentation, Rice cultivation, Agricultural soils, Prescribed burning of savannahs, Burning of agricultural residues
LULUCF	Forests, Grasslands, Cropland, Wetlands and Settlements (Deforestation and Forest Degradation, Enhancement and Maintenance of Carbon Stocks)
Rubbish	Solid Waste Landfill, Wastewater Treatment
PIUP	Cement production

6.2.5 TARGET GASES

TABLE 4: GREENHOUSE GASES CONSIDERED AND GLOBAL WARMING POTENTIAL ACCORDING TO THE REVISED 1996 IPCC GUIDELINES

Greenhouse gases	Global warming power
Carbon dioxide (CO2)	1
Methane (CH4)	21
Nitrous oxide (N2O)	310

6.2.6 EXPANSION AND COMPLETENESS (PARAGRAPH 31(C) AND (D) OF DECISION 1/SC21)

The emissions and removals balance and mitigation actions for these sectors, categories and gases cover more than 99% of national emissions. All source categories of NDC1 are included in NDC2 which also contains details on source categories not mentioned in NDC1, particularly the IPPU sector.

6.2.7 MITIGATION CO-benefits resulting from adaptation actions and diversification plans  
ECONOMIC, INCLUDING PROJECT DESCRIPTIONS  
SPECIFIC MEASURES, INITIATIVES AND ADAPTATION ACTIONS AND/OR  
DIVERSIFICATION PLANS  
ECONOMIC

TABLE 5: MITIGATION CO-BENEFITS RESULTING FROM ADAPTATION ACTIONS AND EXISTING SUSTAINABLE DEVELOPMENT ACTIONS

Sectors	Mitigation co-benefits and description of measures and initiatives
LULUCF	<p>The new Forest Policy developed in 2017 and the National Strategy for the Restoration of Forest Landscapes and Green Infrastructure in Madagascar provide for the massive restoration of mangroves. A national mangrove restoration programme will be developed, with a total target of 170,000 ha by 2030.</p> <p>The improvement of the conservation of natural forests and the management of protected areas integrating climate refuge zones, the restoration and protection of riparian forest corridors, as well as the creation of wood supply areas, are measures recommended by the National Adaptation Plan.</p> <p>The Malagasy State is also making efforts to restore forests to meet the wood needs of the population. Madagascar has also committed to restoring 2.5 million ha of forest landscapes by 2020 as part of the implementation of the African Forest Landscape Restoration Initiative (AFR100) and 4 million hectares by 2030. This commitment will serve as an objective for the accounting of the following other efforts.</p> <p>Since January 2019, forestry has been subject to a note suspending forest exploitation and export aimed at cleaning up the exploitation of forest products. This measure contributes to the reduction of emissions from forest degradation and deforestation.</p> <p>Madagascar is in the process of implementing a pilot programme to ban the use of mercury in mining. This program will be implemented from 2023 and provides for the formalization of smallholders who will be empowered to limit the impacts of their activities on deforestation and forest and land degradation. These actions will strengthen ecosystem services and at the same time strengthen carbon sinks.</p> <p>Various territorial planning and development programmes are being launched, including the restoration of watersheds upstream of agricultural perimeters, sustainable agriculture using the landscape approach, ecological villages, the fight against endangered species and habitat conservation, and the conservation of key species with economic values.</p>

Sectors	Mitigation co-benefits and description of measures and initiatives
<b>Agriculture</b>	<p>Madagascar is joining the African initiative to adopt climate-smart agricultural techniques or CSAs by 2025. The national objective is to strengthen the resilience of production systems and promote sustainable agricultural practices to mitigate greenhouse gas emissions. 50% of producers will have access to agricultural services, i.e. 1.2 million family farm units.</p> <p>Madagascar's NAP reinforces the development of Integrated Resilient Agriculture Models and less methane emitting and continues to promote the Intensive Rice Cultivation System and the Improved Rice Cultivation System. This initiative was developed as part of the implementation of the NAPA and has been adopted by the Africa Rice Initiative. The NAP also plans to valorize by-products and develop income-enhancing value chains to limit the expansion of forest and wetland conversion. The NAP advocates mixed production systems combining crops and livestock, the implementation of a pastoral water programme, the diversification of fodder plants and a gradual shift towards extensive livestock farming models.</p> <p>Various current or contemporary initiatives with the implementation of the NDC2 will certainly have impacts in terms of reducing GHG emissions: Improvement of rice productivity (mitigation of GHG emissions and reduction of the conversion of forest land, grasslands and wetlands to rice plots); improved variety (hazard-resistant and short-cycle); erosion control programmes; land-based planning with a landscape approach (reduction of deforestation and forest degradation, sustainable agriculture); development of sustainable agricultural value chains and value chains; soil protection and rehabilitation and improved food security; improving adaptive capacity and resilience to climate change; agricultural growth and land tenure security. There are many uncertainties in estimating the emission reduction projections resulting from these initiatives; but they will be estimated in the agriculture mitigation scenario of NDC2.</p>
<b>Water Resources</b>	<p>The National Strategy for Integrated Water Resources Management, which should be broken down into plans for the development and integrated management of water resources (SDAGIRE), sets as an objective in 2030, the reduction of evapotranspiration and runoff (reforestation and protection of watersheds), the fight against drought through the protection and restoration of water-related ecosystems, and increasing storage through, among other things, seepage basins on watershed slopes.</p> <p>For the PNA, the Grand Sud is the priority region for the development and implementation of the SDAGIRE. The NAP also advocates, as a measure to adapt this sector, the restoration of mangroves and the preservation of wetlands.</p>
<b>Energy</b>	<p>In 2021, to replace dependence on charcoal and firewood, which constitute the cooking energy of 97% of households in 2020, the Government of Madagascar reduced value-added taxes on butane gas to 5%. In the same year, a public-private partnership was concluded which aims, among other things, to reduce the price of butane gas by 9% and to implement easier access to this cleaner energy.</p>

Sectors	Mitigation co-benefits and description of measures and initiatives
<b>Rubbish</b>	<p>Madagascar continues its slow progress towards reducing emissions from industrial emissions. An initiative aimed at circularity in the textile and clothing industry is being launched, targeting three pilot factories.</p> <p>Madagascar is losing a lot of water resources due to poor sanitation. The Government plans to set up water, sanitation and hygiene and waste management infrastructures.</p> <p>Under the Water Resources sector, the NAP prescribes the renewal of the sewerage systems of all major cities.</p>
<b>Other</b>	<p>Madagascar is in the process of tripling the surface area of its marine protected areas. This programme will enhance ecosystem services and ensure the connectivity of marine habitats and the exchange of gene flow that will promote the adaptation of ecosystems and their components. Although emissions from the destruction of marine habitats were not accounted for in greenhouse gas inventories, these measures contribute to maintaining and enhancing carbon stocks. This program is consistent with the NAP's objective regarding Coastal Zones, and with its objective of operationalizing a sustainable fisheries program.</p>

#### 6.2.8 HOW THE PREPARATION OF THE NATIONALLY DETERMINED CONTRIBUTION WAS INFORMED BY THE RESULTS OF THE STOCKTAKING GLOBAL, IN ACCORDANCE WITH ARTICLE 4(9) OF THE PARIS AGREEMENT

In 2020, Madagascar remains a carbon sink, sequestering 25,527 Gg eq. CO2. This capacity for sequestration is gradually being lost. Just after the year 2025, two years after the end of the first Global Stocktake in 2023, Madagascar will become a net source of greenhouse gases. Apart from the loss of forest cover, which is the main source of the LULUCF sector, the largest increases in emissions are in the Waste sector, the Energy sector, then Industrial Processes and Product Use and Agriculture. Source categories at the level of these sectors will form the targets of the national emission reduction targets in NDC2.

As the Global Stocktake also considers adaptation, means of implementation and supports, as well as efforts to inform, minimize and address loss and damage, NDC2 will also include components addressing these aspects.

#### 6.2.9 METHODOLOGICAL AND METRIC APPROACHES USED FOR ESTIMATING AND ACCOUNTING FOR GREENHOUSE GAS EMISSIONS AND REMOVALS

The national greenhouse gas inventories carried out in Madagascar (CNI, DCN, TCN and CDN1) serve as the basis for the development of the NDC2. These inventories use the Revised 1996 IPCC Guidelines, supported by the IPCC Recommendations on Good Practice and Uncertainty Management for National Greenhouse Gas Inventories (GPG 2000) and the Good Practice Recommendations for the LULUCF Sector (GPG 2003). All greenhouse gas inventories at the sector level are Tier 1.

Madagascar is currently in the process of preparing its first Biennial Update Report and its Fourth National Communication. The results of the inventories corresponding to these national reports will make it possible to update greenhouse gas estimates and emissions. They will feed into the update of the NDC from 2025.

#### **6.2.10 HYPOTHESES AND METHODOLOGICAL APPROACHES USED TO ACCOUNT FOR THE IMPLEMENTATION OF NDC2 POLICIES AND MEASURES OR STRATEGIES, INCLUDING CONSIDERATIONS IN CONSISTENCY WITH ARTICLE 4(14) OF THE PARIS AGREEMENT**

An implementation plan with specific costs and indicators will be developed in conjunction with this document, to facilitate the accounting of NDC2 achievements. The monitoring of the indicators of the implementation plan will feed into the national MRV system and the sectoral MRV systems that have been in the process of being operationalized since 2020. These systems are based on the guidance of decision 18/CMA.1 and its reference decisions. They include sectoral monitoring systems that make it possible to update the values of the reference indicators and to monitor the achievement of the objectives.

Accounting for emissions and mitigation outcomes uses the approaches described above. Double counting is avoided from the consolidation of actions in the Implementation Plan, and then through accounting by the sectoral and national MRV systems. The results will be reported in the Biennial Updated Report and subsequent National Communications that are considered by the UNFCCC Technical Expert Groups.

#### **6.2.11 USE OF VOLUNTARY COOPERATION UNDER ARTICLE 6 OF THE PARIS AGREEMENT**

Madagascar plans to develop national frameworks to benefit from the voluntary cooperation mechanisms of Article 6 of the Paris Agreement. National capacities will be strengthened to facilitate access to climate-smart technologies, for equitable sharing of benefits, for mitigation activities that promote access to sustainable development, and for access to information. National capacities (scientific and technical, institutional) for accounting for emissions and emission reductions, the system for accounting for emissions and emission reductions are to be developed and progressively improved from this NDC2.

#### **6.2.12 FAIR AND AMBITIOUS**

Madagascar is a least developed country that has not historically contributed to global warming. The country remains a sink of greenhouse gases in 2020. A priori, and according to the Lima Call for Action, it seems unfair to ask a country like Madagascar to contribute to global efforts and to set quantified or quantifiable emission reduction targets.

Madagascar is an island nation and has maritime territories with archipelagos that are submersible by rising sea levels. The Government of Madagascar is committed to combating the adverse effects of global warming, as a country that is highly vulnerable and highly exposed to extreme weather events and slow-onset events. The climate change measures proposed in the NDC2 strengthen the nation's environmental integrity and secure the ecosystem services essential for its sustainable and equitable development. Furthermore, the Government of Madagascar is aware that current global efforts to reduce greenhouse gases are largely insufficient and cause loss and damage, particularly for the most vulnerable countries such as Africa and island nations. The Republic of Madagascar is thus making its contributions to limit the global temperature increase to 1.5°C by 2100.

In the context of the global pandemic due to COVID-19, Madagascar continues to demonstrate its willingness to solidarity and good faith in all aspects of sustainability and equity. Madagascar would like to strengthen the awakening of collective consciousness for the respect of commitments, and calls on those responsible for global change to show the way and undertake actions corresponding to their responsibilities and capacities.

**6.2.13      PROGRESS OVER CONTRIBUTION  
PREVIOUSLY DETERMINED AT THE NATIONAL LEVEL  
(ARTICLE 4(3) OF THE PARIS AGREEMENT), PASSAGE  
PROGRESS TOWARDS ECONOMY-WIDE EMISSION  
REDUCTION TARGETS, TAKING INTO ACCOUNT  
DIFFERENT NATIONAL CIRCUMSTANCES**

**Greenhouse gas sources and impacts**

NDC1 considered only the following sectors: Agriculture, Energy, LULUCF and Waste. NDC2 included the Industrial Processes and Product Use sector. This has raised the ambitions in relation to the sources.

**Ambitions to reduce emissions and increase absorption capacities**

By 2030, the CDN2 aims to reduce greenhouse gas emissions by 28%, or 32,642 Gg eq. CO<sub>2</sub>.

In addition to this reduction in emissions, the NDC2 aims to strengthen the capacity of its greenhouse gas absorption by around 20%, i.e. -37,809 Gg eq. CO<sub>2</sub> from additional sequestration.

By 2030, the NDC1 has targeted a 14% reduction in direct greenhouse gas emissions, equivalent to 29,990 Gg eq. CO<sub>2</sub> and an additional sequestration of -61,000 Gg CO<sub>2</sub> eq. CO<sub>2</sub>, i.e. 32% strengthening of carbon sinks. The mitigation ambitions presented in NDC2 appear to have regressed compared to those of NDC1; but they are realistic and achievable, and reflect the realities of current and projected sectoral policies and socio-economic contexts. For LULUCF, mitigation potentials for mitigation actions were not fully enshrined in NDC2 as these potentials will not be fully expressed by 2030. Only 25-30% of the LULUCF mitigation outcomes are expressed here.

**Other Progress from NDC1**

The NDC2 includes sectoral and regulatory policy-making activities that should enable the country to gradually scale up its climate actions, in parallel with its Sustainable Development Goals. In addition, the implementation of many climate actions is cross-sectoral and is an action to scale up initiatives already started before 2020.

The operationalization of the national and sectoral MRV systems will make it possible to collect data that will allow the country to gradually move towards a political reflex of reducing emissions at the level of the economy. To this end, as stipulated by Article 4, paragraph 5, of the Paris Agreement, as a developing country, the Government of Madagascar intends to benefit from the support of the other Parties to the Paris Agreement for the achievement of the objectives contained in its NDC2.

Low greenhouse gas emission development strategies, plans and measures Madagascar is in the process of developing its low greenhouse gas emission development strategy, with support from the United Nations Development Programme. The document is currently being finalized.



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