

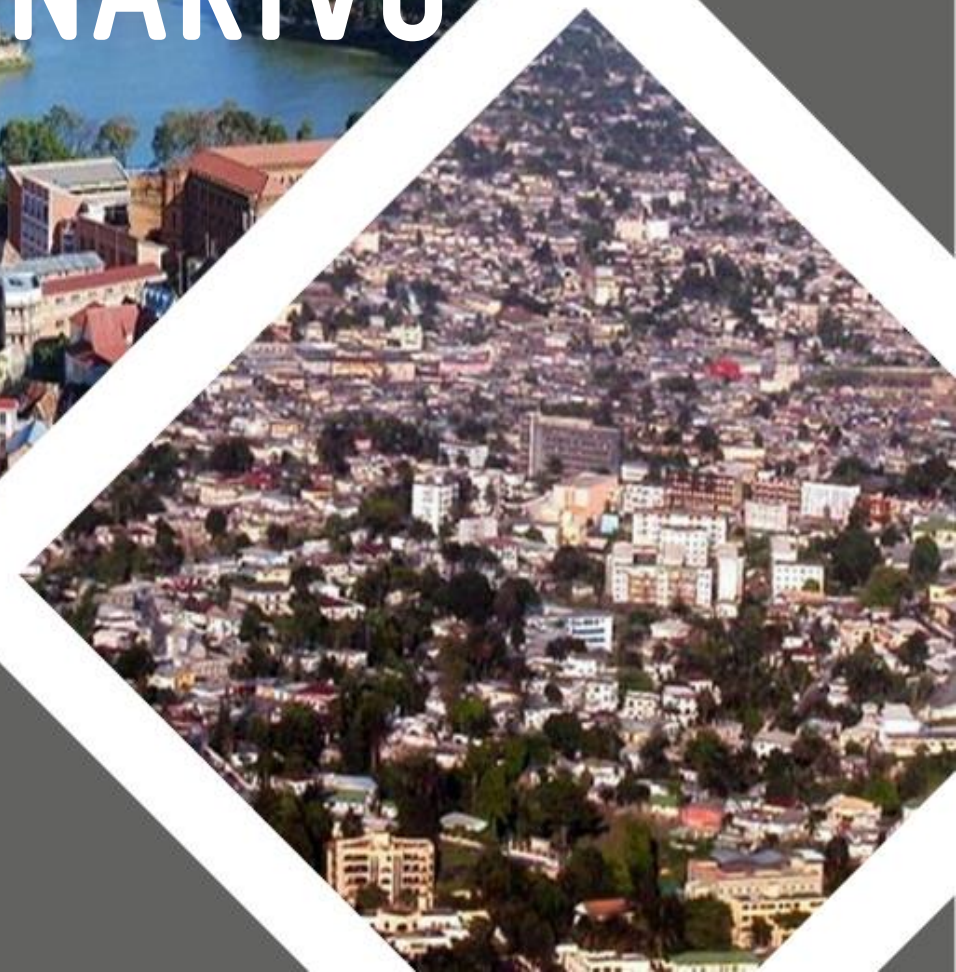
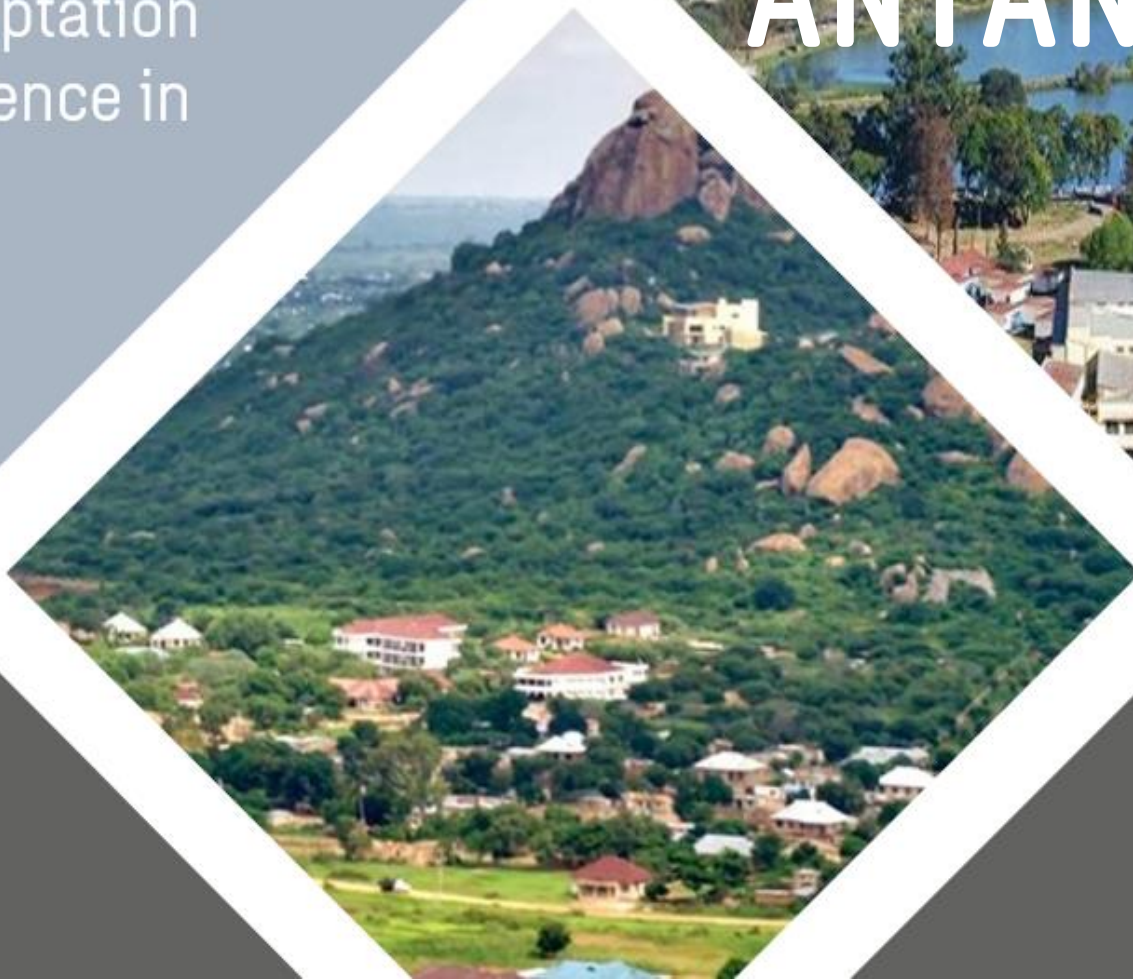


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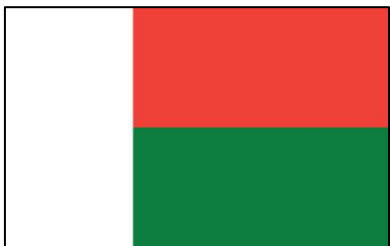


Final Report
Climate Risk
Assessment
Urban Adaptation
and Resilience in
Africa
– Summary

ANTANANARIVO



Madagascar in 2020



Population: 28 million

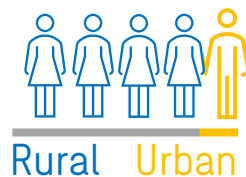
Provinces: 6
Regions: 22
Districts: 116
Communes: 1 548
Fokontany: 16 969

Capital: Antananarivo

Urban Population

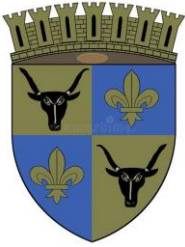
3.7 million people live in Antananarivo, which is about **13% of the Malagasy population** (City Diagnostic, 2021)

Urban proportion of total population:



Antananarivo

Antananarivo

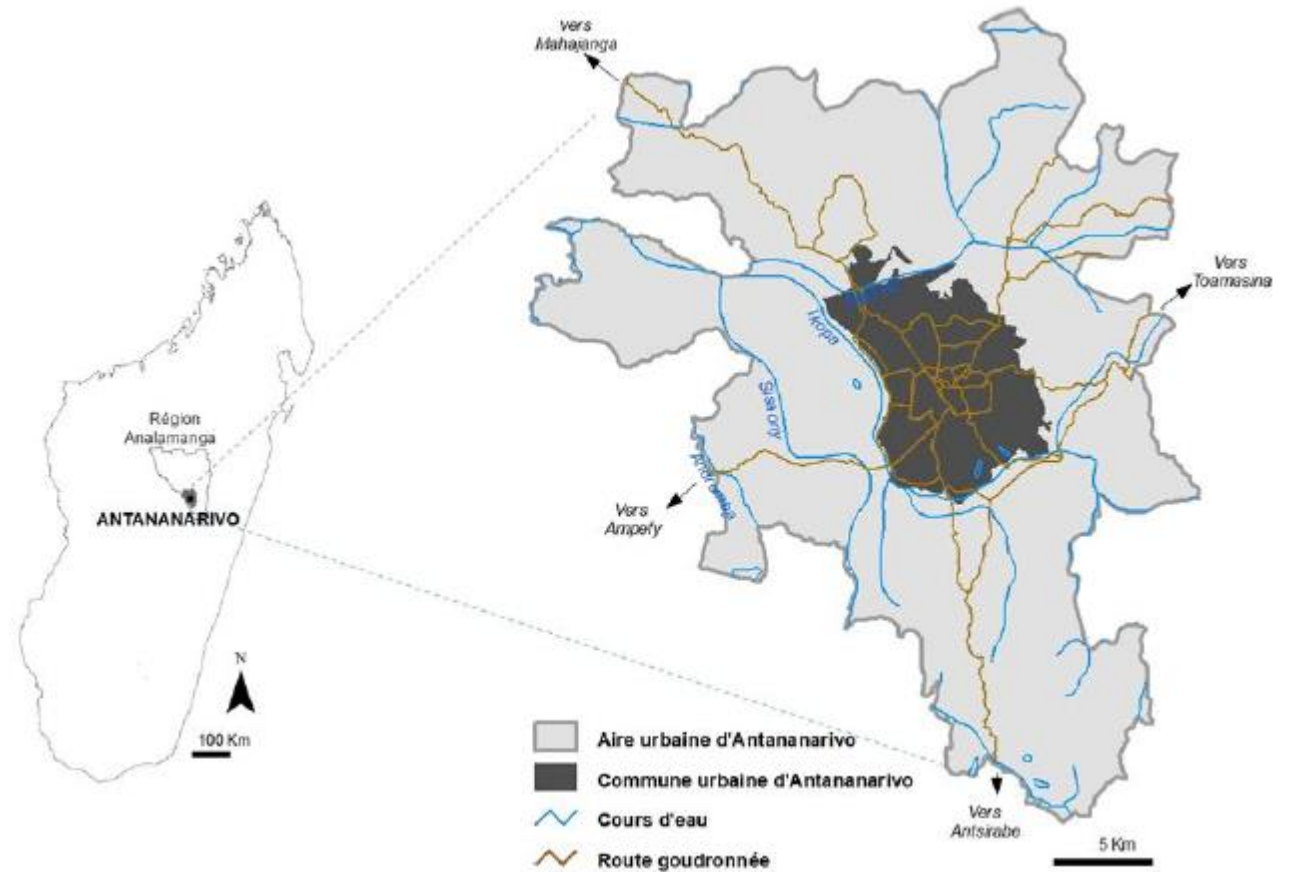


Administrative Area of the city “Grand Tana”

- Known as Antananarivo-Renivohitra
- Located in the regions of Analamanga and Itasy
- Subdivided into 571 Fokontany
- Consists of the Urban Municipality of Antananarivo & 38 associated municipalities
- Population: 3 700 000

Urban Municipality of Antananarivo (CUA)

- Area: 770 km²
- Population: 1 300 000
- Consisting of 6 Municipal Boroughs
- Altitude: 1280 m
- Founded in 1610



Map of the administrative boundaries of the “Great Tana” (City Diagnostic, 2021.)

Antananarivo

Main Challenges

1. **Climate migration:** due to drought and cyclones people leave rural areas and move to Antananarivo (Interview Nzeyimana, 2022).
2. **Informal settlement:** most growth takes place in low lying and flood prone areas due to a lack of space in the city .
3. **Old** and insufficiently maintained **infrastructure:** most (sewage and drinking water) infrastructure does not meet the (quality) demand (Interview City Advisor, 2022).
4. **Socio-economic inequalities** are expressed spatially as the higher casts live in the highlands and the lower casts in the low flood prone areas.
5. The result is that the **poorest people** are living in the areas that are **the worst affected by climate impacts**, having **no access to public services** and are affected the most by **cyclones and flooding**.

Madagascar National Climate Governance

National Climate Adaptation Strategy

National Level

The **Ministry of Environment and Sustainable Development (MEDD)** is responsible for Climate Change Adaptation



Policy – A National Climate Adaptation plan has been elaborated in 2021 (the PNA)

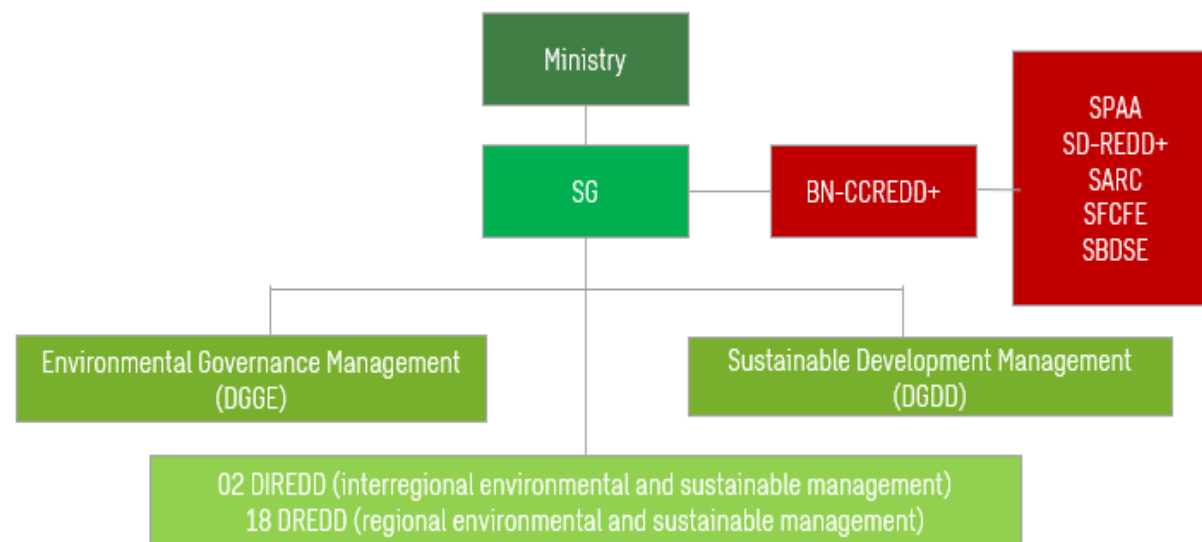


Monitoring



Evaluation

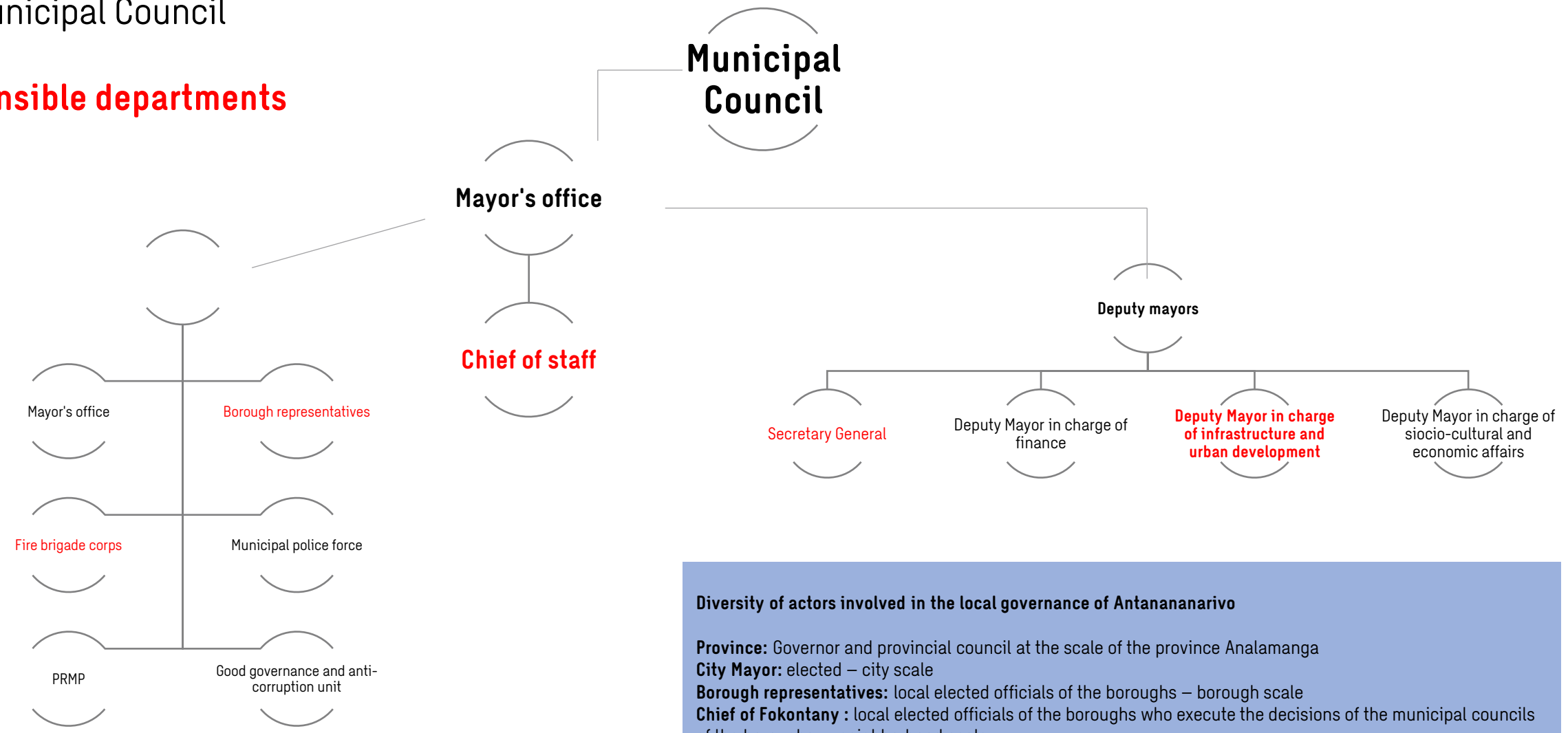
The **National Office for Climate Change and the Reduction of Emissions due to Deforestation and Degradation of Forests (the BN-CCREDD+)** is responsible for the coordination of all climate change and climate adaptation initiatives in the country.



Antananarivo- Governance

The Municipal Council

Responsible departments



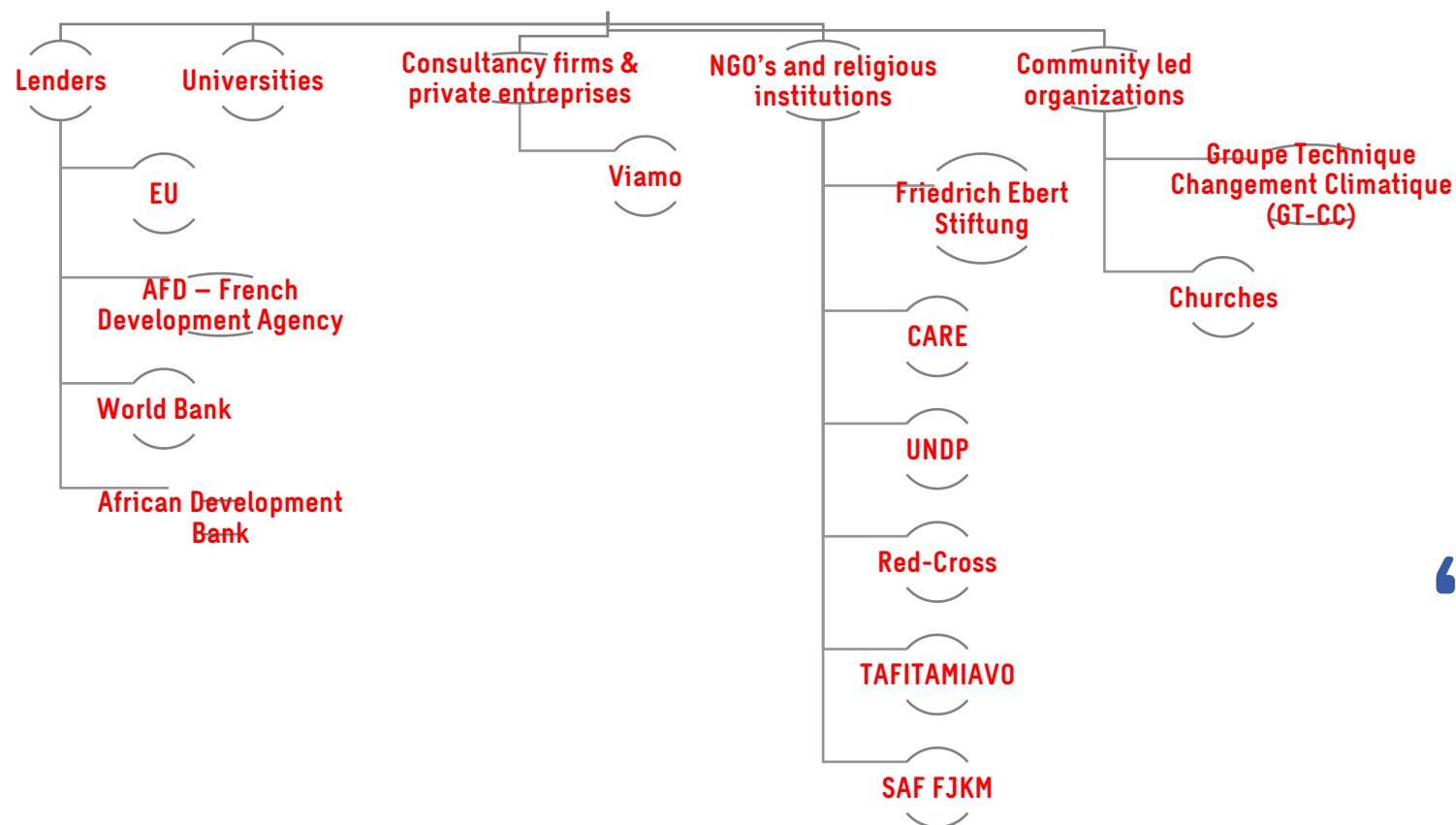
Diversity of actors involved in the local governance of Antanananarivo

- Province:** Governor and provincial council at the scale of the province Analamanga
- City Mayor:** elected – city scale
- Borough representatives:** local elected officials of the boroughs – borough scale
- Chief of Fokontany :** local elected officials of the boroughs who execute the decisions of the municipal councils of the boroughs. – neighborhood scale

Antananarivo- Governance

Other key stakeholders

Key Stakeholders



“ The MEDD encourages citizen engagement by often organising sensibilisation campaigns. (Interview with BNCCRED+, 2022) ”

“ There is a need to encourage and accompany the creation of community organisations that are representative of the CUA. (Interview with AFD, 2022) ”

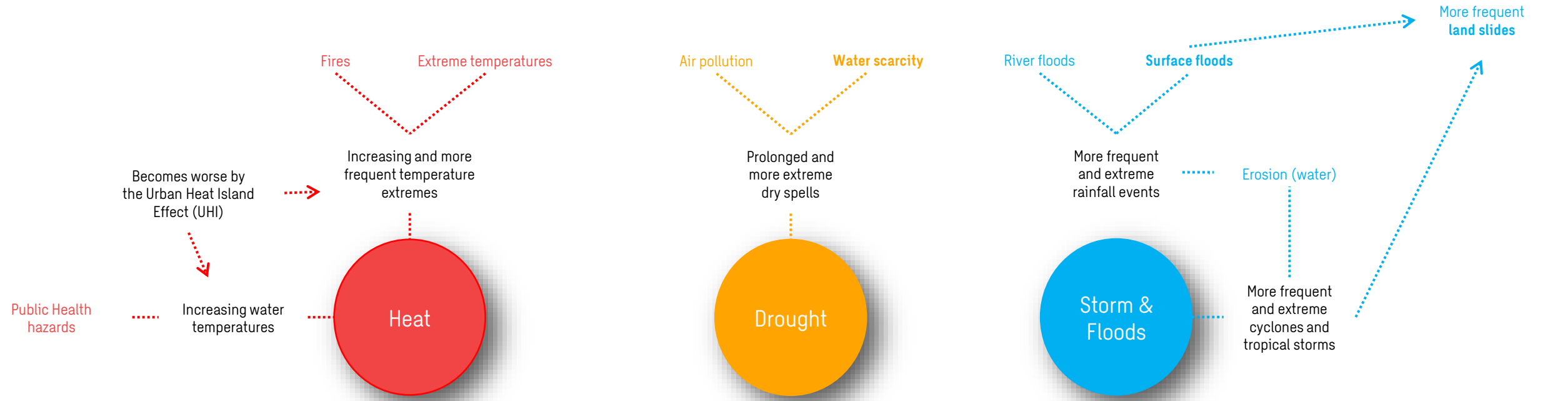
Madagascar

Main Governance Challenges

1. There is a lack of efficient coordination which results in overlap of certain initiatives (Interview Chief of Staff, 2022).
2. There is a lack of technical and institutional capacities (Weiskopf et al., 2021).
3. There is a lack of funding and insight on available international funding opportunities. (Interview Chief of Staff, 2022)
4. There is suboptimal communication between the national and regional levels (Weiskopf et al., 2021).

“More than sixty climate vulnerability studies have been done, but often they come, do their study and then leave again with the information and findings” (Interview BN-CCREDD+ , 2022). ”

Main climate hazards



LEGEND
In black: Primary Climate Hazard
In colour: Secondary Climate Hazard

Impact Floods & Storms on relevant city sectors

LIST OF SECTOR-BASED IMPACTS (FLOODS & STORMS)			
Hazard theme	Capital	Sector	Impacts
FLOODS & STORMS	SOCIAL	Health	During floods latrines overflow, water stagnates causing a major health risk.
			Damage to health centers negatively impacts the health services.
		Water Resources	During heavy rains the water treatment infrastructure is not able to cope with the amount of water thus water provided by the public utility is contaminated in January and February every year.
			Cyclones cause damage to infrastructure and flooding lowers the water pressure and also completely submerge certain water taps.
		Education	As a result of floods and landslides many areas become uninhabitable. This results in a high number of evacuees and casualties – increasing the number of school drop-out.
			Many schools are also evacuation sites in case of floods, this results in the interruption of classes.
	NATURAL	Agriculture & Livestock	The rice fields and low lying lands flood , which damages crops. In addition, cyclones damage crops such as banana, coffee and cacao. This leads to increased food shortages and hunger.
			Due to rainfall intensity and lack of rainwater drainage there is more and more erosion and slope instability.
		Forests & Biodiversity	Ecosystems can degrade.
		Fishing	Vulnerability of the fishers increases due to reduced fish migration and impacted reproduction cycles.
	ECONOMIC	Infrastructure	There are high costs for pumping to avoid flooding, and high costs for maintenance and repair of damaged infrastructure.
			When the floods come into the neighbourhoods this often results in huge traffic jams (people can be stuck for hours) .
			Due to an increase in cyclone intensity, an increase in damage to infrastructure and buildings is expected. In 2015 damage due to floods was 1% of the GDP.
		Habitats & New Towns	Cyclones and strong winds can collapse buildings that do not follow the building standards. Due to climate change the intensity of cyclones is increasing.
			During floods water goes into houses. Employment decreases, travelling is difficult and the environment becomes dirty, odorous and very unpleasant. There are long queues for the kiosks.

Impact of heat on relevant city sectors

LIST OF SECTOR-BASED IMPACTS (HEAT)			
Hazard theme	Capital	Sector	Impacts
HEAT	SOCIAL	Health	Increases the risk of respiratory diseases and pre-existing conditions (such as cardiovascular problems). Many areas become more favourable to the transmission of climate-sensitive vector-borne diseases, including malaria, as well as dengue, chikungunya, and yellow fever. Also, there is an increased risk of water borne diseases.
		Water resources	Risks of higher evaporation rates, leading to reduced humidity in the soil and reducing the refill of groundwater.
		Education	Previously mentioned risks will also affect school children.
	NATURAL	Agriculture & Livestock	The increased average, minimum and maximum temperature will lead to increased evapotranspiration and reduced soil humidity. This will lead to increased livestock deaths and crop failure. There will be a higher need for irrigation, especially for the rice agriculture.
		Forests & Biodiversity	Increased risks of degradation of ecosystems due to deforestation.
		Fishing	Risks of degradation of the fish habitat and ecosystems, resulting in fish migration.
			Evaluated risks to fish reproduction cycles.
	ECONOMIC	Infrastructure	Risks of fragilisation of the infrastructure during periods of extreme heat.
		Habitats & New Towns	The heat can lead to fires that can quickly spread in the densely build part of the informal settlements. As an example, in 2020 the neighbourhood 67Ha had a fire that burned 290 houses and left 1000 people homeless (City Diagnostic).
			Temperatures might increase with 1-5 degrees depending on the climate scenario. The heat has a negative impact on the structural integrity of buildings that do not follow the building standards.
			The Urban Heat Island Effect becomes worse, as well as problems with ventilation.

Impact of drought on relevant city sectors

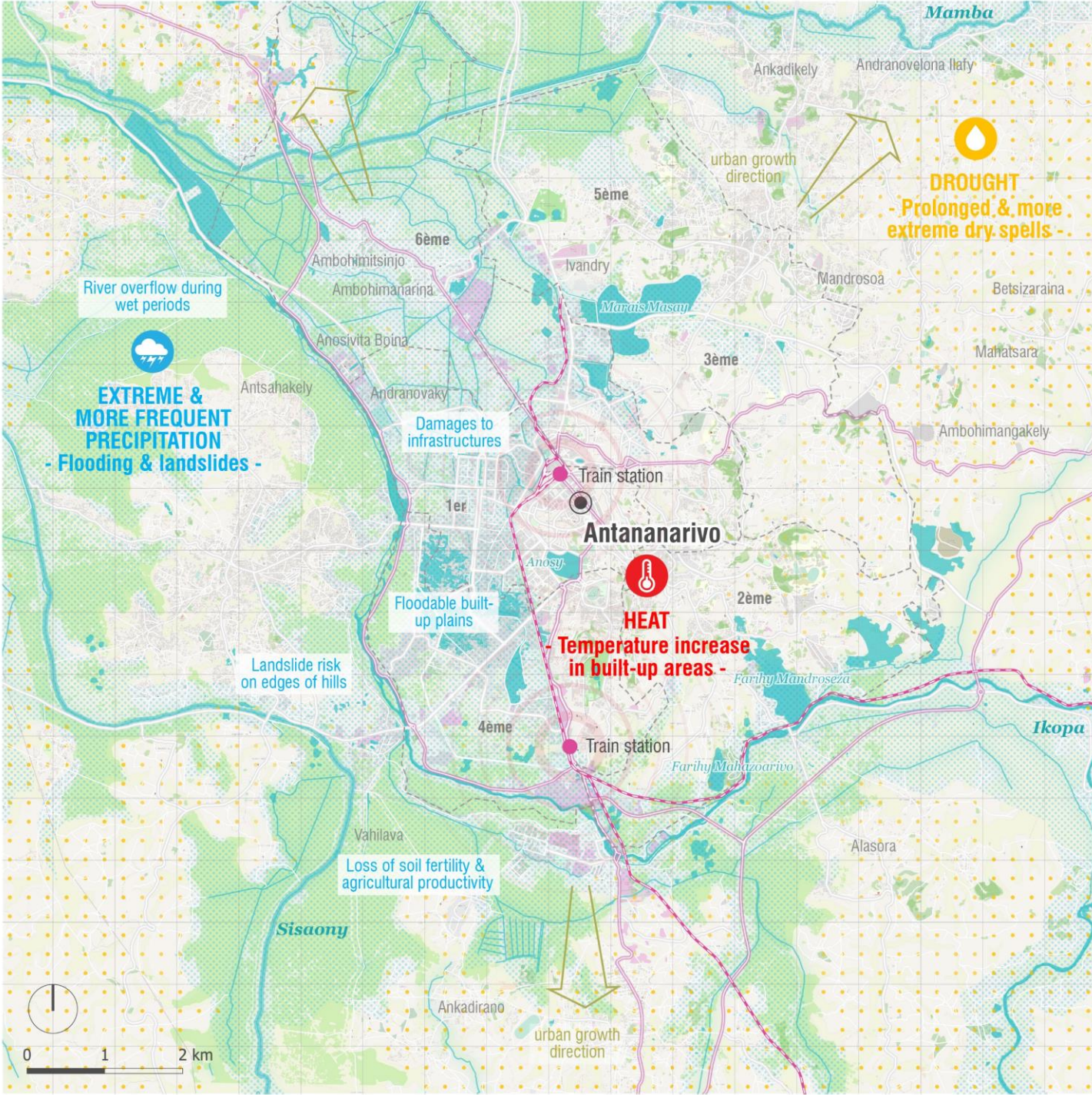
LIST OF SECTOR-BASED IMPACTS (DROUGHT)			
Hazard theme	Capital	Sector	Impacts
DROUGHT	SOCIAL	Health	Insufficient piped water supply can lead to waterborne diseases such as cholera, typhoid, amoebiasis, cyclosporiasis and giardiasis.
		Water resources	Drought can lead to increased water shortages for tap water due to a lack of river and groundwater. Due to changing rainfall patterns, Madagascar has suffered from droughts in the last years. The hydro power stations are dependent of rainfall rivers, and less rainfall could mean that less energy could be generated. This could be a problem as 55% of the energy in Antananarivo comes from hydro power.
		Education	The food is coming from the rural areas. Famine and drought have been major issues in the rest of the island including Antananarivo, which also affect school aged children.
		Security	Negative impact on security in the city as a result of climate migrants coming to the city and they are unable to farm in the city.
	NATURAL	Agriculture & Livestock	There will be a higher need for irrigation, especially for the rice agriculture.
			A shortage of rainfall can be a disaster for rainfed crops. Reduced precipitation and a longer dry season are projected to decrease the growing season up to 50 days by 2100, especially in southern and western Madagascar. Droughts can also lead to outbreaks of migratory grasshoppers that can extend over large areas and destroy entire fields. Madagascar is projected to become more suitable for cassava pests as well.
			Droughts cause food insecurity and nutritional insecurity leading to humanitarian emergencies. For example, the 2017-2018 drought in the southern regions reduced agricultural production by 60% and threatened 1.3 million people with food security issues.
	ECONOMIC	Fishing	Water scarcity can reduce survival of plant species and thus reduce productivity. In addition, this can lead to greater food insecurity for other species.
		Infrastructure	Drought can impact the socio-economic development - When people do not have access to enough (drinking) water they are dehydrated - this has an impact on the efficiency of labour.

Antananarivo

Spatial Diagnostic

This map shows the climate hazards in the CUA.
(Sweco, 2022)

-  Train station
-  Rail line
-  Main road
-  Secondary road
-  Airport
-  City centre
-  Administrative boundary
-  Floodable area
-  Green areas
-  Lake
-  River
-  Informal settlements
-  Built up areas
-  Economic zone
-  Drought
-  Deforestation
-  Urban growth direction



CLIMATE CHANGE

HAZARDS

PRIORITY CLIMATE RISKS

HEAT



The urban heat island effect increases



Extreme temperatures

DROUGHT



Longer & more extreme droughts



Water scarcity

FLOODS & STORMS



More frequent & extreme precipitation events



More frequent & extreme cyclones and tropical storms



Rainfall-induced landslides



Flash floods



River floods



Social

1. Displacement and loss of lives.
2. Negative health impact.
3. Disruption of community life.
4. Disruption of service provision.



Environment

1. Food insecurity.
2. Climate migration.
3. Reduction of arable land.
4. Damage to crops and livestock.



Economic

1. Damage to buildings and infrastructure.
2. Costs for disaster management and repair.
3. Negative impact on socio-economic development.

Passed and Planned Investments

Introduction

Past and Planned Investments

Please look at Annex 3 to see a full overview of identified past and planned investments. This overview shows what is happening in the city and what the next steps will be.

Here we have made a selection of what we consider the five most relevant past investments

1. Integrated Urban Development and Resilience Project PRODUIRE in Antananarivo (IDA – 75 million).
2. PIAA-SDAA Urban And Sanitation Master Plan for Antananarivo (FDA – 28 million).
3. ADAPT'ACTION setting up a national climate adaptation policy and governance framework (AFD, 30 million).
4. SUNREF mobilising the financial sector to invest into climate change (adaptation).
5. ANTANANARIVO Vision 2040 (2025-2040) (AfDB ,2021).

Identified as the ***most relevant planned investment***:

6. Setting up a city climate adaptation policy and plan.





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