

# THE DEEP SOUTH

Constraints and opportunities for the population of southern Madagascar towards a sustainable policy of effective responses to recurring droughts/emergencies:

*Socio-economic, historic, cultural, political, anthropological and environmental analysis of Madagascar's southern Region*



## DISCLAIMER

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**Photos in the report:** Timothy Healy / 2016 & Dave Emilio / 2017

## ACKNOWLEDGMENTS

This report written by Timothy Healy was conducted under the supervision and guidance of Andrea Vermehren (Lead Social Protection Specialist, World Bank) and Julia Rachel Ravelosoa (Senior Social Protection Economist, World Bank). It is part of a series of studies on the South of Madagascar. This report and its results were discussed intensively with representatives of the Ministry of Population, Social Protection and Promotion of Women, FID, and UNICEF. It was also presented during a restitution workshop of the three studies on the South of Madagascar in January 2017 and received observations and comments from various institutions such as UNICEF, WFP, FAO, USAID, CRS, UNDP, etc.. Invaluable comments were received from colleagues at the World Bank.

The World Bank is grateful to the participants of the various validation meetings and workshops and for their comments and precious advice.

This report was prepared under the direction of Coralie Gevers, Country Manager, Mark Lundell, Country Director, and Dena Ringold, Practice Manager.



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## ACRONYMS

AEPSE	Programme Assainissement, soins primaires de l'Environnement
AES	Alimentation en Eau dans le Sud
AFD	Agence Française de Développement
AINA	Actions Intégrées en Nutrition et Alimentation
ANEA	Autorité Nationale de l'Eau et de l'Assainissement
ASARA	Amélioration de la Sécurité Alimentaire et Augmentation des Revenus Agricoles
BAD	African Development Bank
BNGRC	Bureau National de Gestion des Risques et des Catastrophes
BP	Before Present
CI	Conservation International
CSA	Centres de Services Agricoles
CSB	Centre de Santé de Base
DELSO	Project de développement de l'élevage dans le Sud Est
ENSOMD	Enquête Nationale sur le Suivi des indicateurs des Objectifs du Millénaire pour le Développement
EPM	Enquête Périodique auprès des Ménages
FAO	Food and Agriculture Organization
FEWS	Famine Early Warning System
FJKM	Fiangona n'i Jesoa Kristy eto Madagasikara
FRAM	Fikambana n'ny Ray Aman-drenin'ny Mpianatra
FRDA	Fonds Régionaux de Développement Agricole
FTM	Foiben-Taosarintani n'i Madagasikara
G4S	Group 4 Security
GIZ	Gesellschaft für Internationale Zusammenarbeit
HIMO	High Intensity Workforce
IFPRI	International Food Policy Research Institute
INSTAT	Institut National de la Statistique
IPC	Integrated Phase Classification
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature (IUCN).
JICA	Japanese International Corporation Agency
JIRAMA	Electric utility and water services company of Madagascar

## ACRONYMS

MAM	Moderate Acute Malnutrition
MBG	Missouri Botanical Gardens
MNP	Madagascar National Parks
NASA	National Aeronautics and Space Administration
NGO	Non-Government Organisation
OCHA	Office National pour l'Environnement
OMD	Objectifs du Millénaire pour le Développement
ONE	Office National pour l'Environnement
PAEPAR	Projet Pilote d'Alimentation en Eau Potable et Assainissement en milieu Rural
PA	Protected Area
PHBM	Projet de mise en valeur de la Haute Bassin du Mandrare
PERR-FH	Projet Eco-Régional REDD+ - Forêts Humides de Madagascar
PSDR	Projet de Soutien au Développement Rural
REDD+	Reducing Emissions from Deforestation and forest Degradation
SADC	Southern African Development Community
SAM	Severe Acute Malnutrition
SAP	Système d'Alerte Précoce
SLM	Sustainable Land Management project
SPAM	Spatial Production Allocation Model
STD	Sexually Transmitted Disease
UN	United Nations
UNDSS	United Nations Department of Safety and Security
UNFCCC	United Nations Framework Convention on Climate Change
UNPOP	United Nations Population Division
USAID	United States Agency for International Aid
USDoS	United States Department of State
VOI	Vondron'Olona Ifotony
WFP	World Food Program
WHO	World Health Organisation
WWF	World-wide Fund for Nature



# E XECUTIVE SUMMARY



The Deep South is a holistic study which proceeds through a historical perspective of the constraints and opportunities for the populations of southern Madagascar in nine districts within Atsimo Andrefana, Androy and Anosy regions. The objective of this work is to assist the development of the south towards a sustainable policy of effective responses to recurring droughts and emergencies. The key aspects of the study include socio-economic, historic, cultural, political, anthropological and environmental analysis.

The south is classified as semi-arid and influenced by climate change, while recent El Niño events potentially provide a lens for the future. Currently average rain is relatively low at 350mm due to the rain-shadow effect in the south-east of the country attached to the Anosyenne Mountains. In addition, an upwelling located offshore and to the south of Madagascar also induces cold currents limiting the development of clouds along the southern coast. Due to the dry nature of the area, food crops include mainly manioc, maize and beans, although there is limited and localised irrigated rice production in the northern and eastern sectors of the south. While maize remains popular with local people it is not the most suitable crop for this agro-climatic zone. Crops are mainly used for subsistence, while small scale livestock are important for cash including seafood products sold mainly to collectors for export, and hotels or restaurants. Finally, cattle are numerous and hold a major cultural role for the peoples of the south.

Droughts in the south are classified as chronic and have existed in the region prior to the arrival of humans. Meanwhile famines in the area have been recorded since the end of the 19th century. Now climate change poses potential risks and has already increased average temperatures in the region combined with erratic rainfall patterns, which have compounded the effects of droughts, cyclones and the influence of plagues of locusts. From the end of 2015 through 2016 to 2017, the El Niño effect, which occurs every 2 to 7 years provoked a severe drought and malnutrition, appeared to have some of the most severe effects in last 50 years. In total about 30 million people are affected by this phenomenon in dry parts of Africa including southern Madagascar. Future events across the continent by 2050 point to average calorific intakes, availability of fruit and vegetables and meat supplies falling, while mortalities each year will rise due to climate changes, where half of the victims in the future will originate from Africa. Already by 2016, there has been a rise in moderate acute malnutrition in young children from the Deep South. In the south, famine has been reported regularly since the early 20th century and long before global awareness led by various agencies including the United Nations through national and international media outlets.

The inhabitants of Madagascar and the Deep South are principally rural communities dominated by a relatively young population. Health and education of the people and services are relatively poor across Madagascar, but significantly worse in the south. Many people cannot pay medical services with 33% access across the country and only 44% for the southern regions. Meanwhile, nutrition for children has improved in Madagascar, although droughts



in south still have detrimental effects on the young. Vaccinations figures for Madagascar are 51% on average but only 31-37% in the south. Clinics or CSB to people ratios for the south are similar to the rest of country, although they are dispersed over very large areas in south. 13% of CSBs were non-functional in 2013, while the highest numbers of CSBs to be closed to save principally money following the Coup of 2009 were in the south. People who have had an education is on average 44% in Madagascar but only 20% across the south, while literacy rates for over 15 years olds are on average 72% in the country and only 44% for the south.

Poverty, measured by the number of people living on less than US\$1.90 per day (PPP dollar, 2011) shows almost the entire South to be very poor. The poverty incidence is 91 percent in the south compared to 77 percent for the rest of the country. Vulnerability to poverty is greater in rural areas. Climate change impacts have likely exacerbated the situation in the South due to the El Nino drought in late 2016 and early 2017. Agricultural activities suffered and are expected to contract by nearly 6 percent in 2017 compared to 2016.

The peoples, traditions and lands in the Deep South revolve principally around transhumance, semi-nomadic cultures and sedentary agricultural patterns. There are six major peoples in the south with strong cultural links among the Tandroy, Mahafaly and Karembola peoples in comparison to the others Bara, and Tanosy and Tatsimo. Cultural identities are strong and power structures are aligned to communities, clans, lineages and specific families. During the colonial period, the people of the Deep South were taxed but there were few efforts to develop infrastructure in the Deep South, to educate the population or in other ways to improve their situation.

The general history of the peoples of the Deep South is summarized in Box 1.

**Box 1. History of the Peoples of the Deep South**

The history, distributions and evolution of populations across the region is thought to have begun with settlers in the south from the 7th century and composed of Swahili traders followed by other migrant groups from the hinterlands. These early civilisations established large Mandas or enclosures on the coast and near river valleys between the 10th and 13th centuries composed of settlers, nationals and traders. By the 14th century people have started to move inland to isolate themselves into smaller settlements during times of local warfare, and did not expand their settlements again until colonial times. By the 17th century, semi-nomadism has become well established with ritualistic attachment between man and cattle. Coastal, trading and fishing become less important, as generally observed in the 21st Century, as peoples looked inland.

However, the peoples of the south were notable cattle traders and merchants associated with their Swahili origins until the 13th century. Later, there was a decline in trade as semi-nomadic cultures evolve with warfare and isolation, reducing commerce across large parts of the south. Trade resumes from the 18th century with exchange of notably cattle for arms by proxy through Tanosy peoples, as other peoples remain reticent of foreigners. In the 19th century, trade expanded between the Europeans and the Deep South, and often with Tanosy people who traded with others peoples from the Deep South, while the Tandroy and others remained rather reserved from engagement. Guns from Europeans are a major trade for cattle and combined with regional and local hostilities. During this period, the people of the Deep South maintain their quasi-independence with the defeat by Tandroy of Merina people's armies attempting to pacify the south and unify the country.

The rebellions against colonials were caused by French adversity to the culture of semi-nomadism, tombs and cattle, rather than taxation and sedentary agriculture. Taxation rebukes in the Deep South continued until the early Independence of Madagascar. The French neo-colonial period contributed to the fall of the 1st President followed by appeasement reactions from the Government at that time, which is similar to responses to Malaso banditry today. Meanwhile, the region has remained virtually isolated from the rest of the country, as reflected by limited safe routes across the Deep South.

The lack of a road network and other infrastructure in the Deep South contributes to its continuing isolation. The poor infrastructure is due in part to the lack of commitment by the elite of the Deep South represented in the capital, and in part to the lack of sustainable impacts of relief efforts. During the wet season (December to March), UNDSS classifies all roads as impassible, and only restricted and critical UN missions are carried out by air. The region's isolation plays a large part in its insecurity, with traditional cattle theft evolving in recent times, into organized crime. This cattle theft was likely exacerbated by criminals delivering cattle to some partially foreign-owned export abattoirs.

Food insecurity is still prevalent due to droughts, irregular rainfall and other impacts of climate change. Rainfall patterns have been changing since the 1930s, becoming more concentrated within the December to March period and much drier during planting seasons. Higher temperatures and evaporation have been clearly observed during the last 15 years, as temperatures and rainfall have become more erratic. At the same time, questionable new crop varieties have been introduced, and preferences for unsuitable cultivation of water demanding maize has evolved. In addition, value chains for crops such as sorghum remain undeveloped. This situation is compounded by the lack of reliable sources of quality seed, as well by lack of both rainfall and effective irrigation schemes.

Access to water is paramount to the survival of the people of the Deep South. An estimate reported by the Intergovernmental Panel on Climate Change (IPCC) states that the proportion of the African population at risk of water stress and scarcity increasing from 47% in 2000 to 65% in 2025, generating conflicts over water, particularly in arid and semiarid regions (Bates et al., 2008), such as the drier regions of southern Madagascar. Since the 1990s, some international agencies have responded to water shortages by providing water to local communities for distribution or means for rain-harvesting, but these interventions have not been able to significantly improve the situation. Meanwhile, the management of water distribution by the Alimentation en Eau dans le Sud (AES) program under the Ministry of Water, and Energy and Hydrocarbons, is regarded as largely ineffective. Most rivers in the south are ephemeral (dry for part of the year), although there is potential to exploit some watercourses in the eastern part of the region, either from the surface or under riverbeds. However, groundwater is of poor quality in many places due to sedentary agriculture. In addition, about 70 percent of the water points (boreholes and pumps) once available in the Deep South had failed by 2002, with the remainder serving only about 20 percent of the population. There has been limited public investment in water infrastructure since 2009, although UNICEF has restored 550 water points since 2014. Overall, there is an important need for depoliticization and decentralization of water management with capacity building to support local people's control of water provision with technical assistance and management structures that foster its sustainability.

With the region's reliance on rain fed agriculture, malnutrition and famine are likely to grow worse during longer and more frequent periods of drought. Others dangers for the south include rising populations, the limited ability of sedentary farmers to move and adapt, and increasing incidence of locusts and other pests. Well-being indicators from 1960 to 2010 have slowly risen, although the number of malnourished children under five years of age in Madagascar across multiple income deciles is likely to increase.

Going forward, options to address food insecurity will need to include more effective irrigation schemes, as well as appropriate seeds and fertilizers. This may require the support of permanent agricultural extension officers, as suggested by some local farmers, rather than the current donor-led Regional Agricultural Development Fund (FRDA) approach, which is short term, unsustainable and can be unreliable as the expertise is sometimes unavailable in some regions for farmers. An Integrated Phase Classification (IPC) for famine alerts, with full regional cover of parts of Africa and Madagascar, is currently being developed. It aims to improve upon the former Système d'Alerte Pré-

coce (SAP), which was oriented only to areas near communal capitals, by covering more rural areas and integrating monitoring of agricultural production and climate change. In addition, the IPC will help to avoid confusion on the part of local populations between famine response systems and various development programs across the south. There is also need to move toward private sector investment and diversify economic growth through non-agricultural and commercial options, which are often not seriously addressed or discussed for the south.

The Deep South is also affected by bush fires and deforestation. Fires often occur prior to wet (planting and grazing) seasons to clear existing fields before planting and to improve grazing, while deforestation is principally associated with clearing land for new sedentary crop farming areas. Both fires and deforestation are increasing due to population pressures. Protected Areas (PAs) also create indirect pressures on non-protected forest zones. Burning of PAs has been observed in satellite imagery from 2014.

Land access issues are affected by both land grabs and PAs, and have an impact on local peoples in search of land for cultivation and grazing, particularly in light of the lack of alternative economic activities and limited fertile lands. Some inland cattle farmers are now migrating from the Mahafaly plateau to the southwest coastal areas, where they are permanently settling and demarcating lands. This migration pattern could potentially incite land conflicts with existing communities in these coastal areas.

The loss of dry and spiny forests is a major issue for conservation and biodiversity. Humanitarian organisations have worked with conservation organisations to protect forests, although their efforts are generally regarded by conservation NGOs as ineffective and unsustainable. In addition, local people, including local management committee members attached to Vondron'Oloha Ifotony (VOI), do not gain sufficiently from conservation initiatives, since the financing for PA management is often under the auspices of NGOs rather than going directly to villages. During the period when new PAs were being established from 2003 onwards, there was also a significant rise in land conversions from forest to agricultural lands by sisal companies, which continue to compete for land and forested areas with local populations.

In terms of economic development, efforts to integrate the local economy into the country's formal or semi-formal economy have been resisted since pre-colonial times. Nevertheless, the proportion of taxes collected in the Deep South is higher than many other parts of Madagascar, which may indicate a stronger economy could potentially contribute more tax to society compared to the limited wealth returned to the state from rich regions growing vanilla in the northeast of Madagascar. The tax system is highly decentralized, and generally does not benefit communes or villages. Development assistance is often short term, piecemeal and not clearly distinguished from humanitarian or famine assistance. In fact, development and assistance strategies sometimes appear to contradict each other, as when food aid is provided at the same time that exports of crops from the same locality are encouraged.

Local groups have asked to receive aid resources directly instead of through NGOs, in order to take advantage of small commercial opportunities in their localities. Women, in particular, are eager to develop intuitive solutions for their communities, including through cash transfers. This scenario, with appropriate financial and technical assistance, offers potential avenues to support deeper human capital and broader economic development. To be effective, however, such assistance will need to be accompanied by vital support and improvements in basic health and reproductive services; better nutrition, in particular for children; and improved education, beyond just classroom infrastructure. To meet these needs, and help the population to overcome the damage caused by years of criminality and violent conflict, the Government of Madagascar will need to reassert its role in the governance of the region and become a driving force for sustainable and equitable development.





# 01 INTRODUCTION

## 1.1 OVERVIEW OF MADAGASCAR AND THE DEEP SOUTH

Madagascar is in the southwestern Indian Ocean. It has a total area of 587,041 square kilometres (365 square miles) and a coastline of 5,603 kilometres (3,482 miles). The island is divided into 22 administrative regions, of which three regions, Atsimo Andrefana, Androy and Anosy, covering nine biogeographical districts, are referred to as the Deep South.

The topography of Madagascar is varied, with peaks of up to 3,000 meters (9,800 feet) above sea level. The Deep South is hilly in the interior, with plateaus and plains toward the coast, consisting mainly of rolling ancient sand dunes. The country's climate is generally tropical, with regional variations. Average annual temperatures range between 23° and 27°C (73° and 81°F), depending on altitude. Precipitation is determined by the monsoon and trade winds blowing across various parts of the island. However, the Deep South does not receive regular rains from the east, due to the rainshadow effect of the Anosyenne Mountains near the south-east coast. In addition, an upwelling located the southern coast induces cold currents, limiting the development of clouds along the southern coast (Mahatante, 2016). Consequently, the southern area receives as little as 350 mm (14 inches) of rain per year, on average, giving the Deep South a semi-arid climate (Ministère de l'Environnement et des Forêts, 2010).

Although Madagascar's economy is agrarian, much of the land is unsuitable for cultivation because of mountainous terrain, extensive lateralization<sup>1</sup>, and inadequate or irregular rainfall. Only about 5 percent of the land area is cultivated at any one time, of which 16 percent is irrigated. In addition to providing livelihoods for two thirds of the population, agriculture contributes 29 percent of the nation's GDP. The economy also benefits from trade and a small but uncompetitive industrial sector (USDoS, 2011).

Many farmers across Madagascar including the Deep South practice subsistence agriculture on small family plots in rural areas. Crop varieties for small-scale farming across Madagascar include rice, cassava, bananas, maize, and sweet potatoes; however, national yields are generally insufficient to meet domestic demand, and are sometimes declining. Per capita rice production fell from 1.2 tons in 1975 to only 0.9 ton in 2006 (Rapport National d'Investissement Madagascar, 2008). Limited industrial agriculture includes sisal in the south and sugar cane plantations in the northern half of the country.

Slash-and-burn agriculture is common, and results in environmental degradation and forest loss. The technique has been perpetuated by the lack of adequate infrastructure in many rural regions, as well as limited access to information, agricultural inputs, credit and markets (Erdmann, 2003) which may offer alternatives incomes, such as small-scale industries with access to markets. This situation makes adaptation to climate change more challenging, as it restricts options for agricultural diversification.

<sup>1</sup> The weathering process by which soils and rocks are depleted of soluble substances, such as silica-rich and alkaline components and enriched with insoluble substances, such as hydrated aluminium and iron oxides. Often these soils are found in tropical countries.



## 1.2 CHALLENGES IN THE FUTURE FOR AFRICA AND MADAGASCAR

Agriculture in Madagascar is already negatively affected by extreme weather events, including droughts and cyclones, as well as other climate-related disasters, including landslides and locust plagues (FAO, 2000, 2010b). The situation is particularly precarious for populations in the Deep South, where droughts and swarms of locusts are predicted to intensify with rising temperatures and increasingly erratic rainfall patterns. The resulting poor crop yields and the decimation of livestock have been devastating for many communities in the south. Initial impacts of drought from UNICEF showed a worrying increase in moderate acute malnutrition (MAM) within a few months into the famine event, among children between 6 months and 5 years old across 8 out of the 9 Districts of the Deep South. Initial results had shown that the severe acute malnutrition (SAM) across the region was near the 15 percent mark, signalling an emergency situation in terms of nutritional outcomes, although this critical figure had already been surpassed in many communes across the South in 2016 (Box 2).

### Box 2. Effects of El Niño 2015/16

The impacts of the El Niño phenomenon on climate and global agriculture have been well documented; although its effects on health and nutrition have been less prevalent. Droughts caused by events from 2015 to 2016 have led to acute food shortages and malnutrition in many countries across Southern Africa including the south of Madagascar.

The 2015/16 El Niño event was one of most severe episodes in the last 50 years from mid-2015. The phenomenon is affecting the food security of 60 million people worldwide, half of whom live in Southern Africa. In Madagascar, the World Food Programme (WFP) completed several assessments (over nine months in 2015/16) estimating that the number of people exposed to food insecurity was more than 1.3 million in the Deep South and semi-arid lands of Madagascar. Overall, this event provides a lens for countries in the developing world and exposes potential scenarios for the future, as climate change advances.

According to FAO, agricultural and nutritional consequences of this latest episode are being felt acutely across drier parts of Africa, including Southern Africa affecting the lives of 30 million people. The FAO has also identified a number of 'high priority' countries and those 'at risk' in Africa. The latter group includes Madagascar amongst several others in the region. This agency also estimates that it will cost approximately US\$2.3 billion to deal with the effects of the 2015-2016 El Niño events around the world.

The climate impacts were felt until the end of 2016, while the number of people at risk of famine, known locally as kere, will continue to grow. According to a recent study by Oxford University, this type of event may occur more regularly with climate change (Springman et al., 2016). Modelled effects of climate change on global agriculture and nutritional consequences show a reduction in average calorific intake worldwide, a decrease in availability of fruit and vegetables, and falls in meat supplies by 2050. These impacts are expected to cause significant additional mortalities per year, often as a result of malnutrition, of which almost half the cases would come from Africa.

The direct impacts of El Niño in Madagascar have already affected the northern regions of the country, which are experiencing more rain and flooding than usual. Meanwhile the Deep South experienced a drought that was much more severe and broader in scope than was predicted. The effect of the drought on the region is further amplified by the fact that it is one of the most food insecure parts of the country and has experienced several successive years of poor crop yields.

Madagascar is a signatory to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. Although the Government adopted its National Adaptation Programme of Action in 2006, institutional progress on climate change has been slow due to limited finances and political uncertainty.

There are a number of UN bodies and partners working in the Deep South, including various NGOs, that have intensified their efforts to address climate change impacts. Their activities include food distribution, cash and food-for-work programs, seed distribution, school canteens, and food supplements for moderately and severely malnourished children. However, given the severity of the drought, these programs are not sufficient for the kind of events that Madagascar has recently faced as they lack means to build resilience and independence from future emergency support. Moreover, the situation is projected to remain dire for some time to come. Discussions with the Government and results from several studies and assessments in the South (see list of references in the annex) indicate that the region's population would continue to need seasonal support during the dry season, as well as assistance for the recovery of people's livelihoods in the future medium term.

## 1.3 RATIONALE AND APPROACH FOR THIS STUDY

This comprehensive study of the Deep South of Madagascar was supported by the World Bank through its El Niño Trust Fund. The study aims to present the socioeconomic, environmental, historic, cultural and political determinants of stagnation of the Deep South, and how those factors have contributed to the region's inability to effectively cope with climate change. The study also looks at emergency responses to famines by aid agencies since the 1990s, and at development projects and programs, to derive lessons that will inform the preparation of more sustainable and resilience building interventions for the Deep South.

The analysis was based on consultations with all parties in the three target districts, including the beneficiaries of various interventions across the south; interviews with key academics (University departments in Toliara and Ambovombe), local and regional government authorities, NGOs and civil society organisations (WWF, Gret, Andrew Lees Trust, CARE...), donors, and aid agency program and project managers; and secondary literature, including articles in the press.

The research was also supported by an ancillary study supported by the World Bank in parallel with this work during 2016. One focused on statistical analysis of secondary data from household and demographic surveys. That study identified the specific differences between the south and to the rest of the country. Analytical results provided an understanding of sources of growth and income, social factors, and the importance of assets such as land, cattle and access to water. Key aspects of the findings are found in section 2 and 3 of this study. The second supplementary study focused on government policies and donor engagements in the South, including poverty alleviation and humanitarian relief programs, with an assessment of why such programs failed when similar programs have succeeded elsewhere in the world.



# 02

## SOCIO-ECONOMIC, ENVIRONMENTAL, CULTURAL AND POLITICAL DETERMINANTS OF STAGNATION IN THE SOUTH

### 2.1 INTRODUCTION

This section of the study provides a snapshot view of key social and economic indicators for Madagascar and the Deep South. It is based principally on statistical analysis of secondary data from household and demographic surveys, as well as on supplementary data from numerous reports cited in the references.

### 2.2 KEY SOCIAL AND DEMOGRAPHIC INDICATORS FOR THE SOUTH

The analysis compares the characteristics of the country and the south using several key indicators:

- population and household demographics;
- health;
- education;
- poverty issues.

#### 2.2.1 POPULATION AND HOUSEHOLD DEMOGRAPHICS

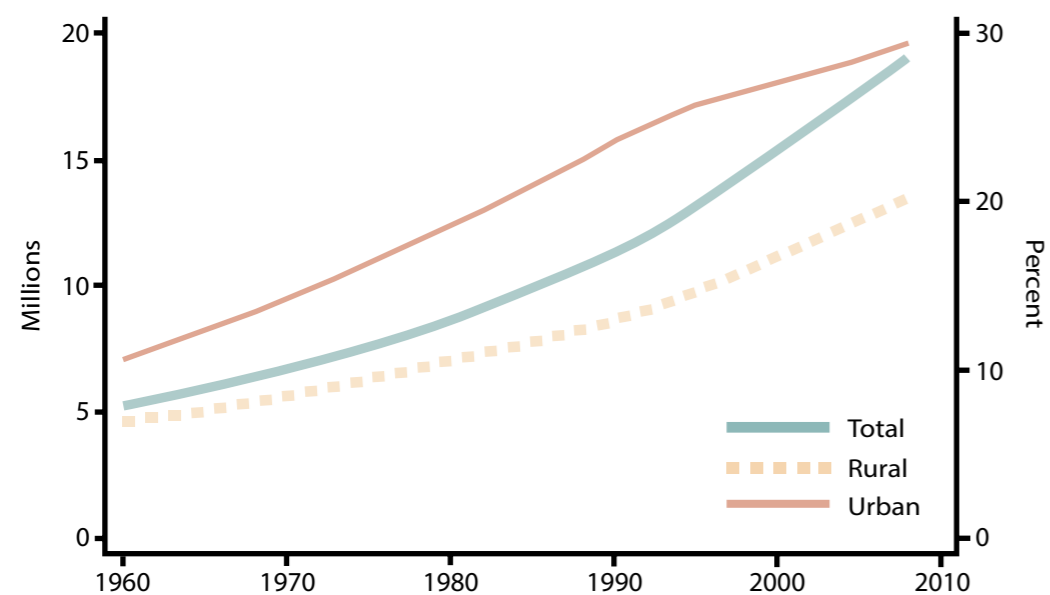
Madagascar had a population of 23 million in 2016, about 12 percent of whom live in the three regions of the South (World Bank, 2016). Figure 2a shows Madagascar's total and rural population, and share of the urban population. The rural, urban, and total populations have been growing at an increasing rate in the four decades from 1960 through 1999. This growth is attributed to high fertility rates, with improved health services leading to better maternal care and a drop in under-5 mortality.

Over the last 30 years, the country has seen a slight declining growth rate in all population categories, with overall growth at 2.69 percent in 2008 compared to 2.86 percent in 1988, due principally to reduced fertility rates from family planning (Sharp and Kruse, 2011). By 2005, at least 18 percent of women of childbearing age were using contraceptives, and the average fertility rate was down to 5.4 children per woman, although the rate can be as high as 7–10 children in some rural areas (IMF, 2007). Growth trends in the Deep South are comparable to other rural populations in Madagascar; however, some families have significantly higher numbers of children, although mortality figures for their young are also dropping, as they are elsewhere in the country (see Figure 2b).

Most people in Madagascar continue to live in rural areas, although urbanization rate is rising. The urban population constituted 29.5 percent of the total population in 2008, up from 10.6 percent from 1960. The increasing rate of urbanization, coupled with more frequent extreme weather events and the country's low adaptive capacity, poses challenges related to urban water scarcity and diseases from poor sanitation. Only 35 percent of the national population has access to safe drinking water (IFPRI, 2013) in predominantly urban areas. This factor is less significant for the Deep South, which is predominantly rural with relatively small urban communities, although it is imperative to mention that water in general is scarce in the rural areas.



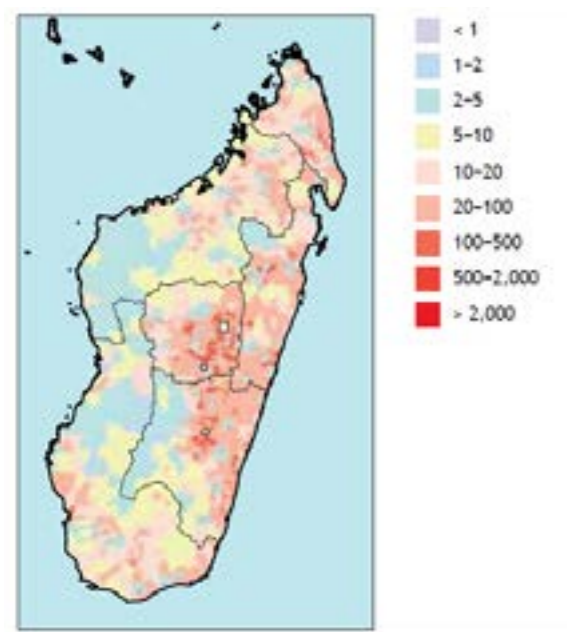
Figure 2a: Population trends in Madagascar: Total population (blue line), total rural population (dotted yellow line), and urban population's percentage growth rate (red line) from 1960–2008



Source: World Development Indicators (World Bank, 2009) & IFPRI, 2013

Figure 2b shows the geographic distribution of the population across Madagascar in 2000 as persons per square kilometre. These estimations are based on census data and other sources. Madagascar has a relatively low population density, estimated at 32.8 inhabitants per square kilometre (PNUD 2010). Generally the population is unequally distributed, with the eastern sectors and central highlands being more densely populated when compared to the western and southern parts of the island with relatively low densities. These densities range from 5 to 20 persons per square kilometre, due to the semi-arid nature of the terrain and lower carrying capacities for people dependent upon rainfed agriculture and free-ranging cattle.

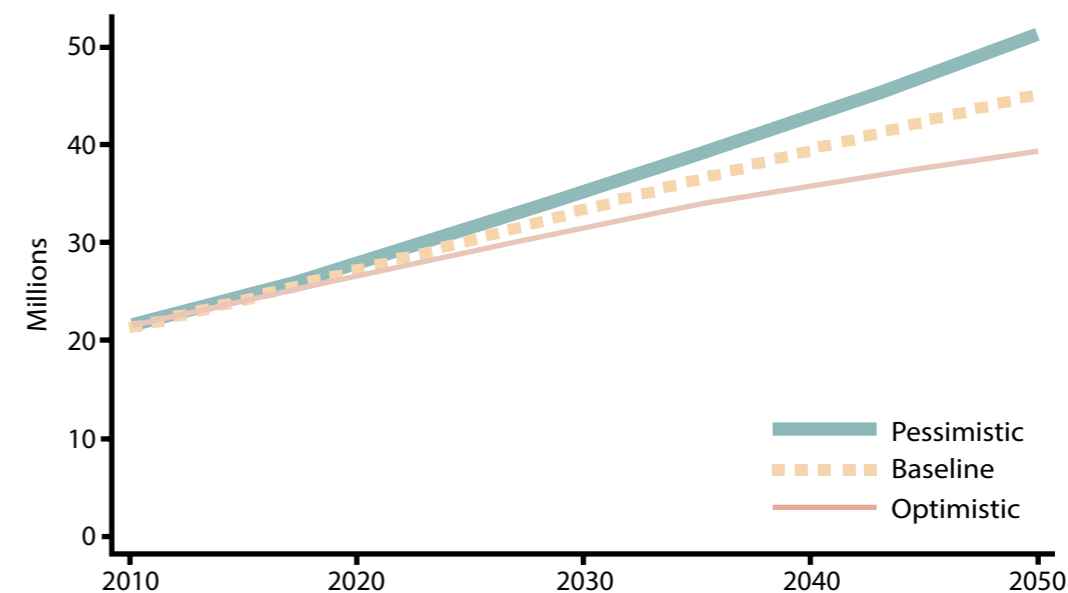
Figure 2b: Population density distribution in 2000



Source: Ciesin et al., 2004 & IFPRI, 2013

Figure 2c shows population projections by the UN Population Division (UNPOP) through to 2050. The projections for the Malagasy population for 2050 range from under 40 million people to almost 52 million people. According to Sharp and Kruse (2011), factors determining health and survival have improved greatly, to the extent that political and economic crises have had negligible effects. Moreover, a substantial proportion of the population is young with high fertility rates, as at least 75 percent of women have had a child by the age of 16. Although awareness of family planning is relatively high amongst teenagers at 45%, although access to these services remains low. Hence it is likely that population growth will follow the high-variant projection, with the population more than doubling by 2050. This scenario is particularly applicable to the Deep South due to low levels of education and lack of access to family planning services.

Figure 2c: Population projection scenarios from 2010 to 2050



Source: UNPOP (2009) & IFPRI, 2013

The figures in Table 2a show high percentages for young people under the age of 15 years across the country and in the south of Madagascar. In the Deep South, the percentage of young people is even slightly higher. Older populations are lower in the south compared to the rest of the country, while unemployment among age groups between 20 and 60 years is also higher. Overall, the demographic dynamic in the south is characteristic of the poorest countries in the world





Table 2a: Distribution of age groups (%) across Madagascar and the south

Age groups	Southern regions			South	Madagascar
	Atsimo Andrefana	Androy	Anosy		
[0-1]	5.1	5.4	4.7	5.1	3.4
[1-5]	15.6	17.1	16.4	16.2	12.7
[5-10]	17.9	18.8	16.3	17.8	16.0
[10-15]	12.9	16.2	14.4	14.2	14.6
[15-20]	10.0	8.5	8.8	9.3	9.7
[20-25]	7.0	6.0	7.1	6.8	7.5
[25-30]	5.5	4.4	5.9	5.3	6.3
[30-35]	5.7	4.2	5.2	5.1	6.1
[35-40]	5.1	3.6	5.2	4.7	5.4
[40-45]	3.6	3.8	3.2	3.5	4.5
[45-50]	3.1	1.6	2.7	2.6	3.3
[50-55]	3.0	3.1	3.1	3.0	3.6
[55-60]	1.6	2.1	2.0	1.8	2.3
[60-65]	1.3	2.0	2.1	1.7	1.9
[65-70]	1.0	1.2	0.6	0.9	1.0
[70-75]	0.9	0.9	0.9	0.9	0.8
75 +	0.9	0.9	1.4	1.1	1.0

Source: Analyse de la situation socio-économique dans le sud de Madagascar, World Bank 2016

### 2.2.2 HEALTH

In general, disease figures among all age groups across Madagascar and most parts of the South stand at 11 percent. The dominant diseases are malaria, followed by diarrhea and respiratory diseases. The level of sexually transmitted disease (STDs) in the Anosy region of the south is relatively high at 1.1 percent compared to the national figure of 0.3 percent (World Bank, 2016).

The number of medical consultations on average for all age groups is slightly higher in the south, at approximately 42 percent compared to 38 percent nationally, which may be associated with diets and quality of water supplies in the Deep South. People in the Deep South use the medical services even when the cost of these consultations is slightly higher in the region compared to rest of the country, which is effectively an added economic hardship for the inhabitants. However, amongst those who stated that they do not use medical services, higher numbers of people (44 percent) stated the reason was lack of money compared to 33 percent on average across the country (World Bank, 2016). Medical services for most rural communities are often provided by isolated and small clinics or CSBs<sup>2</sup>. Due to the remoteness of modern clinics, many people treat themselves for non-serious illnesses.

Child mortality in Madagascar has improved dramatically, which corresponds with improved nutrition (see Section 3). However, the situation is less favourable in the South's drought and famine zones (UNICEF 2015, 2016). There is little difference in acute infant malnutrition statistics for the Deep South compared to Madagascar in non-famine years (World Bank, 2016). This indicates inhabitants of the Deep South have adapted to their environment, although climate change and repeated drought could be problematic in the future without a sustainable response. The vaccination rate of children in the Deep South is seriously low at 31 to 37 percent, compared to 51 percent on average across Madagascar (World Bank, 2016). Key preventable diseases are malaria and diarrhoea affecting approximately

<sup>2</sup> With regard to facilities across the South, they have approximately 13 percent of the nation's Class 1 CSBs and 12 percent the Class 2 which is proportionally similar to other regions, although the area is large and populations are greatly dispersed limiting accessibility. In addition, in 2013 over 13 percent of these CSBs were not functioning (World Bank, 2016). It is important to also note that the highest number of CSBs to be closed due to financial constraints following the coup d'état in 2009 and ensuing political crisis, where those targeted in the South (pers. com. UNICEF), although the rationale for this change remains unclear.

42 and 12 percent of the population respectively in the Deep South being comparable to national figures. It is important to stress that the southern regions are semi-arid, which would naturally minimise the spread of these diseases due to drier conditions. Therefore, the situation for these preventable diseases could be interpreted as poor in the Deep South.

### 2.2.3 EDUCATION

In Madagascar primary school enrolment is significantly higher than secondary school education, while completion of school is only 19 percent at the primary level and 7 percent at the secondary level (IMF, 2007). In the south, about 44 percent of young children have never been to primary school compared to roughly 20 percent in the country (World Bank, 2006a). Non-enrolment figures are conspicuously high in the regions of Androy and Anosy (Table 2b)

Figure 2b: Primary school education levels

Primary school education	Southern regions			South	Madagascar
	Atsimo Andrefana	Androy	Anosy		
Children from 6-10 years who have never been educated at school	36.9	49.2	51.5	43.9	20.3

Source: Analyse de la situation socio-économique dans le sud de Madagascar, World Bank 2016

Figures for children and adults in the Deep South who have never had basic primary education are exceptionally high compared to country figures. Explanations for poor schooling include lack of facilities, financial problems for parents, need for children to work or look after crops or animals, and an overall negative perception of the benefits of schooling (World Bank, 2006a). Poor education levels have also been blamed on the fact that some instruction is in French or English rather than in Malagasy (IFPRI, 2013). The Ministry of Education is currently reviewing a proposal made before the political crisis of 2009 to increase the use of Malagasy in primary education, with options to study in French and/or English at later stages.

Pupil/teacher ratios are slightly higher in the Deep South than national levels; and the average number of pupils per class is 62.4 pupils compared to the national average of 43.9 (Table 2c).

Table 2c: Primary school facilities in 2014-2015

Private and public primary schools	Southern regions			South	Madagascar
	Atsimo Andrefana	Androy	Anosy		
Number of functional establishments	1,829	1,209	810	3,848	31,071
Pupil / teacher ratios	45.2	47.1	47.9	46.3	41.2
Number of pupils per class	59.3	68.9	47.9	62.4	43.9

Source: Annuaire statistique de l'éducation (année scolaire 2014-2015) & World Bank, 2016

Secondary education figures are equally concerning. The percentage of individuals in the 11 to 14 year-old cohort (within secondary school age) is 41 percent across the Deep South and 48 percent in Androy, compared to 15 percent in Madagascar. The total rates for secondary schooling in the Deep South for boys and girls, at 30 percent, are significantly lower than for the country at roughly 45 percent. Fewer girls move to secondary education in Madagascar due to early marriages and responsibilities at home, with girl/boy ratios of 0.88 worse in the south than in the country (0.93). Curiously, more girls reach secondary school in the Androy region, although school figures are poor (Table 2d).

Table 2d: Secondary school indicators for 2011-2012 (%)

1st cycle for secondary school	Southern regions			South	Madagascar
	Atsimo Andrefana	Androy	Anosy		
Individuals from 11-14 years who have never been educated at school	39.2	48.0	37.7	41.4	14.7
Total rates :					
- Boys	45.0	12.1	36.2	32.1	47.0
- Girls	37.6	13.5	28.0	28.4	43.9
- <b>Both</b>	<b>41.2</b>	<b>12.7</b>	<b>31.8</b>	<b>30.2</b>	<b>45.5</b>
Girl/boy ratios	0.84	1.12	0.77	0.88	0.93

Source: Rapport ENSOMD 2012-2013; INSTAT (Tome 2); World Bank, 2016.

In the last few years, the University of Toliara has created an educational annex in Ambovombe (Androy region) for degree students in the arts and sciences (pers. com., Director of University Annex, Ambovombe). However, this institution primarily benefits the elites and not the vast majority, who have little or no education. It is also important to note that the highest percentage of contractual teachers linked to the parents' associations Fikambanan'ny ray aman-drenin'ny mpianatra (FRAM) is found in the Deep South (pers. com., UNICEF), which means there are fewer civil servant teachers with guaranteed full-time employment to serve state schools. In addition, there may be a greater need for a technical college offering basic skills such as electronics, plumbing, agriculture and livestock farming (pers. com., FAO), which may better serve the local populations in the Deep South.

Madagascar has a relatively good average level of adult literacy at present with a national literacy rate in 2011-2012 at approximately 72 percent for people over 15 years old and above school age (see Table 2e). However, in the Deep South, the literacy rate is very poor at about 44 percent, and only 26 percent in Androy. It is important to add that due to current poor levels of primary education, adult literacy is predicted to decline!

Table 2e: Literacy rate for population over 15 years old in 2011-2012 (%)

Literacy rates	Southern regions			South	Madagascar
	Atsimo Andrefana	Androy	Anosy		
Gender :					
Male	54.0	28.3	43.5	45.1	75.1
Female	53.0	24.6	38.4	42.4	68.3
<b>Both</b>	<b>53.5</b>	<b>26.4</b>	<b>40.8</b>	<b>43.7</b>	<b>71.6</b>

Source: Rapport ENSOMD 2012-2013; INSTAT (Tome 2) & World Bank, 2016

## 2.2.4 POVERTY

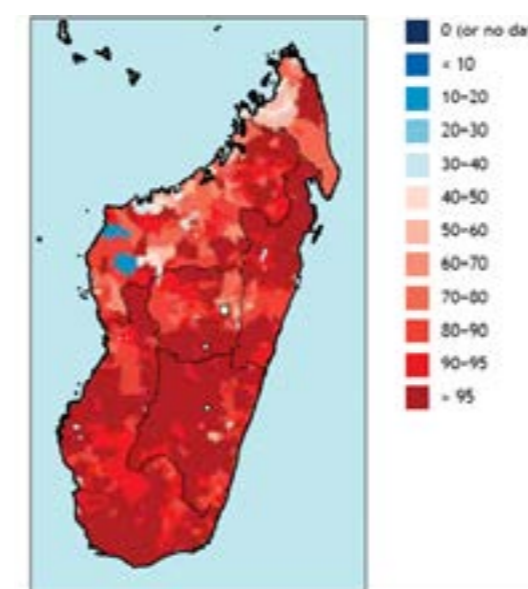
The southern part of the country is significantly poorer compared to some central and northern regions as shown in Figure 2d for the distribution of the population living on less than US\$2 per day across the country in 2005. Moreover the more recent national poverty index Enquête Nationale sur le Suivi des indicateurs des Objectifs du Millénaire pour le Développement (ENSOMD) shows that poverty in Madagascar is extremely high at 71.5 percent for both rural and urban populations in 2012 (Table 2f). By the World Bank definition of less than US\$2/day, poverty is even higher was 82 percent in 2010 compared to approximately 70 percent in the 1990s. This recent effect may be accountable in part to the effects of the coup in 2009 and climatic events across the country.

Table 2f: Poverty incidence (Po) and poverty intensity (P1) in 2012 (%)

Rural or urban areas	Southern regions			South	Madagascar
	Atsimo Andrefana	Androy	Anosy		
Urban	Po	19.9	-	64.9	48.5
	P1	8	-	27.4	18.1
Rural	Po	89.3	96.7	88.8	77.3
	P1	49.6	63.8	49.8	36.4
Both	Po	80.1	96.7	85.4	71.5
	P1	44.1	63.8	46.6	32.8

Source: ENSOMD 2012; INSTAT & World Bank, 2016

Figure 2d: Poverty in Madagascar c. 2005 (% of population below 2\$/day)



Source: You et al., 2010 & IFPRI, 2013

Note: Based upon the 2005 US\$ and purchasing power parity value.

The situation has deteriorated since the coup of 2009, with 90 percent of the population classified as below the poverty line in Madagascar in 2016 according to the World Bank for those living on less than US\$3.1 per day. Prior to 2016, vulnerability was also identified in 2011 as also being greater in the rural areas, where 74 percent live in poverty compared to 54 percent in urban areas (Sharp and Kruse, 2011), which will certainly

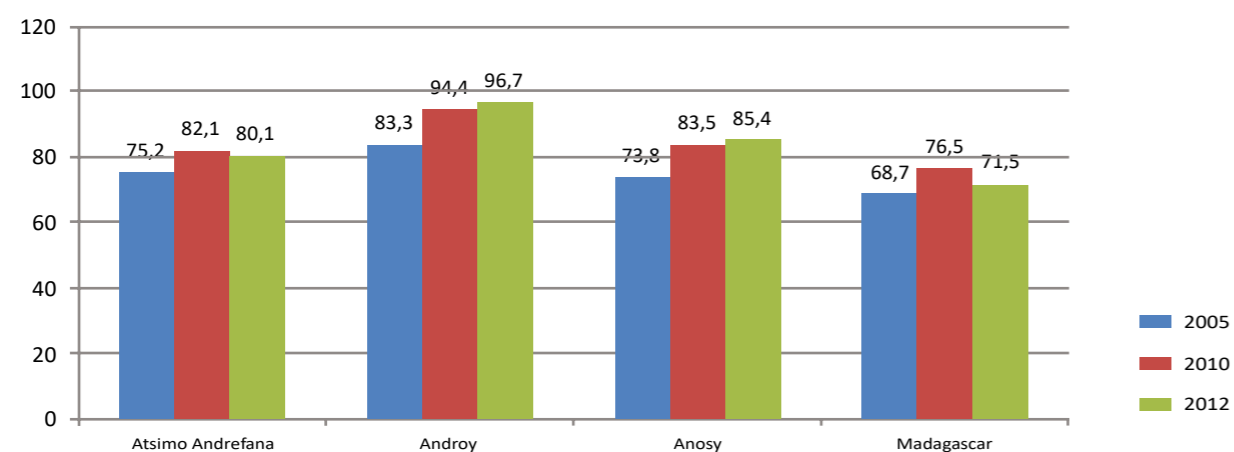


be the similar until now. In addition, the state in 2007 prepared a Vision 2025 for Madagascar which showed that the eastern, southern, and south-eastern parts of the island had poverty rates of more than 80 percent (Figure 2d). The lowest proportions of poverty are in the western parts of the country, where about 20 percent live below the poverty line. High poverty levels suggest that there will be a generally low level of resilience to climate change in the future as indicated by IPPRI in 2013.

The data also show that rural people across the country are poorer than urban dwellers (Table 2f). Curiously, the Deep South has a 91 percent poverty rate compared to 77 percent for the country, although there are fewer poor in the towns of the south.

The evolution of poverty is particularly noticeable in the Androy region, which has steadily increased since 2005. When poverty rates for each region are compared to Madagascar, it is clear that the Deep South is poorer (Figure 2e).

Figure 2e: Evolution of poverty for the periods 2005-2010-2012



Source: ENSOMD 2012, EPM 2010, EPM 2005, INSTAT & World Bank, 2016

The data show a clear association between poverty and various socio-demographic characteristics (Table 2g). In particular, higher numbers of people in a household have an almost exponential effect on poverty, as do lower levels of education. Poor and uneducated parents have uneducated children, creating an endless vicious circle of poverty. Again, the situation is much worse in the south.



Table 2g : Association of socio-demographic characteristics and poverty

Incidence of poverty	Southern regions			South	Madagascar
	Atsimo Andrefana	Androy	Anosy		
Size of household					
1 or 2	47.3	71.1	48.7	51.9	31.4
3 or 4	73.9	94.3	71.8	77.7	57.3
5 or 6	82.9	97.8	89.8	87.9	74.7
7 +	89.9	99.4	98.4	95.2	89.6
Levels of education					
None	91.2	97.5	90.5	93.3	85.3
Primary	84.4	95.4	87.4	86.7	79.0
Secondary	56.9	87.5	59.5	60.2	46.9
Higher	42.3	0.0	14.4	38.3	10.4
Averages	80.1	96.7	85.4	85.9	71.5

Source: ENSOMD 2012, INSTAT & World Bank, 2016

Poverty is severely aggravated by climate change notably drought, late rains and locusts in the Deep South as discussed in Table 2h. The impacts are loss of belongings, which are sold to buy food, and loss of revenue principally from lost agricultural production affecting over 20% of the population in the south and high for the people of Androy (27%). The loss of revenue is more severe as most people are subsistence farmers in the south with losses near and above 50% in Atsimo Andrefana and Androy regions. Figures are less for Anosy as this region has quite localised droughts and famine. Finally, the time to recuperate losses is more often never for the majority of households in the south, while responses to climate change driving intense poverty are too work harder, if people have the opportunities, or simply do nothing (World Bank, 2016).

Table 2h: Climate change impacts and poverty for households (%)

Climate change impacts	Southern regions			Madagascar
	Atsimo Andrefana	Androy	Anosy	
Loss of belongings				
Percentage affected (%)	22.0	27.1	20.0	13.1
Loss of revenues				
Percentage affected (%)	48.1	52.1	29.1	24.4
Time to recuperate losses				
Never recuperated	82.9	91.4	64.1	57.3

Source: ENSOMD 2012, INSTAT & World Bank, 2016

# 03

## SOCIO-ECONOMIC, ENVIRONMENTAL, CULTURAL AND POLITICAL DETERMINANTS OF STAGNATION IN THE SOUTH

### 3.1

### PEOPLES, TRADITIONS AND THEIR LAND: TRANSHUMANCE, SEMI-NOMADIC CULTURES AND SEDENTARY AGRICULTURAL PATTERNS

#### 3.1.1 PEOPLES OF THE DEEP SOUTH

The Deep South of Madagascar is home to six principal ethnic groups, each of which dominates a specific part of the South (Figure 3a). The issue of ethnicity is compounded by former colonial divide and rule policies and their definitions of ethnic differences. These policies essentially divided highland and coastal peoples, leaving a legacy of independence and mutual suspicion that persists today. These factors are particularly important for the Tandroy, who maintain their traditions and sense of independence, and are regarded as an important group for conserving some traditional Malagasy customs which have been lost or changed elsewhere in the country<sup>3</sup> (pers. com., Steve Lellilad).

Figure 3a: Peoples in the Deep South



Source: Parker-Pearson, 2010; FTM hydrographical maps for Madagascar

Figure 3a provides approximate areas where the Tanosy (Anosy) inhabit from the rainforest to the transitional zone of the Anosy Mountains and dry spiny forests in the southeast. The Tatsimo live in the semi-arid zone to the west of the Tanosy as far as the Mandrare River (Rakotoarisoa, 1998). The central area of the Deep South is the territory of the Tandroy (Androy), who live between the Mandrare and Manamabovo rivers near Tsihombe. To the west of this zone and near the coast are the Karembola people. In the far west are the Mahafaly people, located on a plateau and as far as the southwestern coast. Only 60 percent of the dialect in the south overlaps with mainstream Malagasy (Lewis, 2009).

<sup>3</sup> The Tandroy people ("People of the Thorns") derive their name from the spiny bushes ("roy") growing in the region. Due to their strong self-identity, the Tandroy are some of the most researched people of Madagascar, with studies found in pre-colonial works by Flacourt and numerous ethnological and anthropological works from colonial times to the present. Their culture is identified predominantly by patrilineal ancestry and idealized through a projection of their individuality and customs, where non-Tandroy may be regarded as outsiders or foreigners.



The Karembola and Mahafaly often identify themselves as Tandroy when traveling outside the south. The Tandroy consider the Karembola to be ethnically Tandroy, although they have for centuries been recognised as distinct peoples with their own cultural practices (Flacourt, 1661). An important cultural practice which distinguishes the Tandroy from others in the Deep South is circumcision, or savatse which declined in the culture of the Karembola peoples in response to their suppression since the colonial regime (Middleton, 1997). To the north of the Tanosy and Tandroy peoples are vast savannah plains inhabited by the Bara, who are mainly pastoralists.

The societies in the Deep South have important rituals, taboos and hierarchies. Age is an important factor in decision-making, as elders represent spiritual linkages with ancestors. Clans and lineages play a dominant role in decision-making, particularly about land and resources. In these societies, the clan that established a village often has a say over newcomers and dependant clans, and some lower clans may be marginalized. In general, family heads are male and control the household and most of its resources. There are also alliances between clans, and sometimes fictive kinships such as those between the Tandroy and Tanosy. Lineages have a strong sense of solidarity and include lineage allies, matrilineal bonds and patrilineal links often attached to land (United Nations, 2011). These factors of power in the Deep South are so strong that the French researcher Paul Ottino in 1998 once stated:

*To avoid conflict, the young, the poor, women, all those with a mouth which is known to not speak lightly, are condemned to silence.*

Polygamy is practiced among the Tandroy and reinforces alliances and bonds among families and clans, leading to political and economic advantages, including access to pasture during periods of transhumance. This is the process of traveling to different grazing lands, whereby cattle are moved over large distances and in their footsteps the semi-nomadic peoples of the Deep South. Meanwhile, polygamy may involve a man with 4 or even 12 wives, although the first wife often has seniority over the others. Women in a polygamous relationship often play an important political and economic role in the society, as they assist their husband with decisions affecting various clans attached to them.

The importance of cattle for the Tandroy and other peoples of the south, notably the Bara, Mahafaly, and Karembola, is not only a secular means of accruing wealth, but can also assure a comfortable afterlife. It is important to recognise that cultural belief in a hierarchical spiritual world is very important, where sacrificed animals accompany the spirit of the dead. This factor may not be accounted in development scenarios where well-being and income-generation objectives could conflict with investments, such as tombs. Often cultural attachments may not always be interpreted into socio-economic development models by projects or programmes. Not only are numbers of cattle deemed important, but also ancillary factors including the depth of cattle dung in their corrals. Effectively, this custom may not be conducive to using the dung as a form of compost on fields to encourage better crop production as prescribed by some development projects. While for many Tandroy, a man without cattle is often regarded as not a Tandroy.

### 3.1.2 CATTLE AND TRADITIONS

The importance of cattle for the Tandroy and other peoples of the Deep South, notably the Bara, Mahafaly, and Karembola, is not only a secular means of accruing wealth, but also assurance of a comfortable afterlife. A Tandroy man without cattle can be considered a nonperson. Sacrificed animals accompany the spirit of the dead, and tombs are investments in the afterlife. Not only are numbers of cattle deemed important, but also ancillary factors such as the depth of cattle dung in corrals. These cultural practices can be in conflict with development projects that stress the use of dung as fertilizer to increase crop production.

Since the downfall and infighting of the royal dynasties in the Deep South during principally the 19th century, there has been preponderance to construct large tombs. These tombs can be extremely large and decorated with paintings and sculptures. With French influence, since colonial times, these tombs have taken the form of building constructed from stone and also concrete. At least half the population are estimated to be buried in stone tombs across the region (Parker-Pearson, 2010).

Cattle theft was historically associated with young men making their rite of passage to adulthood. The French attempted to suppress this practice during the colonial period, which led to widespread imprisonment in colonial jails (Parker-Pearson, 2010). One of the first buildings to be constructed in the new colonial district town of Ambovombe was the town prison, and this building is still regarded as a symbol of repression in the region (pers. com., Director of University, Ambovombe). Other notable garrison and administrative colonial towns were established at the beginning of the 1900s in Amboasary, Antanimora, Ambondro, Tsiombe and Beloha and other districts in the South in an endeavour to control the inhabitants. Cattle theft associated with young men's rites was never completely suppressed at that time, and has evolved in more recent times into organized criminal rustling activities across the south and some parts of the West.

### 3.1.3 PASTORALISTS TO CROP FARMERS

Southern pastoralist peoples often have herds of cattle, goats and sheep, although the Bara people usually have only cattle. The Deep South's vast grazing lands reach from the hills in the north of the Androy region to the plains of southern Madagascar around the Horombe Plateau (Huntington, 1988).

The majority of Tanosy and Tasimo peoples adopted sedentary lifestyles many centuries ago in order to develop croplands, and now cultivate beans, maize, sorghum and even rice in the wetter areas of the southeast according to the limits of the land, which lend themselves to more subsistence than commercial farming. Most of the Bara, Mahafaly, Karembola and Tandroy peoples, by contrast, have remained pastoralists, although the colonial administration encouraged a shift to crop farming on the rich soils near the coast, which today are cultivated by some Tandroy, although others have tried to resist through maintaining or combining their herds of zebu cattle with semi-nomadic cultures. This shift to sedentarism has contributed to the negative impacts of drought and famine, as the people cannot adapt by relocating to other areas.

### 3.1.4 SYNTHESIS AND DISCUSSION

The Deep South is principally composed of six groups, with notable kinship ties among three of these groups being—the Tandroy, Mahafaly and Karembola in the central part of the Deep South. Elsewhere and to the north are the Bara people, while the Tanosy and Tatsimo are located to the eastern parts of the Deep South. The clans, lineages and families of these peoples play an important role in their social, political and power structures. Overall, the remoteness of these communities has helped to preserve important elements of their cultures and reinforces that majority of people are culturally tied to pastoralism and likely unable to relocate with their herds of zebu cattle in the face of severe climate events

Spiritual attachments to zebu cattle and the building of prolific tombs from the 18th century with ceremonial slaughtering of herds was not appreciated by the colonial administration seeking development of the formal economy as a conduit for paying taxes to them. Significant numbers of the population across the Deep South continued with a lifestyle suiting them and corresponding with the environment and climate, in the face of colonial confrontations. Then and today, the objectives of development for many people in the Deep South have not always shown compatibility with some local cultures.

To the east of the Deep South the Tanosy and Tasimo peoples have for a long time practiced cultivation of their lands, due to a relatively better climate in the eastern sector. Initially this was an advantage for the colonial regime during the process of controlling and appeasing the native populations and also offered significant rewards in tax collection.

Colonial pressures upon local people were effectively a form of social engineering pushing populations into a combination of sedentary and pastoral existences. Then, the lands adopted by pastoralists were capable of agricultural production although the nature of semi-arid lands meant unpredictable and inevitable droughts leading to famine or kere.

The situation today is no different from the past, where there is a cultural need for pastoralism, although many people are tied to cultivation. Development programmes for good reason try to improve a situation which was not the doing or invention of peoples at that time. Meanwhile droughts persevere resulting in foreign interventions combined with development to appease the generated situation, which is likely to become worse with climate changes in the future.

## 3.2 HISTORY, DISTRIBUTIONS AND EVOLUTION OF POPULATIONS ACROSS THE REGION

### 3.2.1 ARRIVALS IN THE SOUTH

The island of Madagascar was originally populated by waves of migrants from both Africa and Austronesia (Allibert, 2008). Fragments of pottery found near the mouth of the Menarandra River and finds from former settlements near the Manambovo River indicate that the Deep South may initially have been colonized by East African Swahili communities during the period AD 600-1000 (Parker-Pearson, 2010). The site also may have been a trading settlement for Swahili merchants from the 7th to 13th centuries, long before European traders used the Mandrare estuary in the Anosy region during the 19th century.

Stories of early occupations of the Menarandra area are part of the oral history of the Taifasy people, who live north of Fort Dauphin (Tolanaro) in the south-east. They recount wars in Africa that caused people to migrate to an unknown land at the mouth of the Menarandra River (Fontoynt and Raomandahy, 1939). These stories are also consistent with archaeological finds near the mouth of the Manambovo River and at the site of the earliest recorded settlements, starting in the 10th century. There is also an alternative theory that most of the Deep South was colonized, also during the 10th century, by some people from western and southwestern coastal communities of Madagascar (Parker-Pearson, 2010).

The first peoples to settle in the region would have brought domesticated cattle. The most common species in Madagascar today is *Bos indicus*, the humped zebu; however, foreign accounts from the early 18th century also mention wild humpless *Bos taurus* roaming throughout the spiny forests of the south (Drury, 1729). These humpless animals may have been feral vestiges of the first herds introduced into Madagascar from Africa, while zebu cattle arrived with later migrations into the south (Blench and Macdonald, 2000). In addition to introducing cattle to the Deep South, the first settlers may have driven to extinction a giant ostrich-like bird known as *Aepyornis* (Elephant Bird) that inhabited remote parts of the south, referred to by Flacourt in 1661, by overconsumption of their eggs.

### 3.2.2 MANDA CIVILISATIONS

From the 10th to the 13th centuries, parts of the Deep South witnessed the evolution of proto-urban or Manda civilizations. These were large, enclosed and densely occupied settlements (Heurtebize, 1986) generally located near inland river systems. The inhabitants traded cattle and possibly slaves and quartz minerals with Arab communities in exchange for Islamic sgraffiato and Chinese ceramics. Based on remnants of the people's diets, it appears that many were Muslims due to the absence of taboo animals such as pig (Rasamuel, 1984). The Manda civilization vanished during the 14th century, leaving no oral or written history. Their decline appears to have been dramatic. Defensive walls suggest a period of warfare, with potential emigration or enslavement. They could also have wiped out by the bubonic plague which swept across Europe during the Middle Ages, although this is less certain (Parker-Pearson, 2010). The fall of Manda marked the end of quasi-urban communities in the Deep South until the Tandroy created larger royal villages in the 19th century (see Section 3.2.6). However, it was not until the French colonial period in the 20th century that the south again saw larger urban conurbations (Dewar and Wright, 1993).

### 3.2.3 ISOLATION AND WARFARE ACROSS THE SOUTH

As the large Manda communities of the south moved into a period of decline in the 14th and 15th centuries, they began to break down into small, isolated units along the entire southern coast and inland. Within inland sites, there was a major shift to pastoralism and cattle as a food source (Rasamuel, 1984), when cattle also became symbolically important, particularly for the Tandroy and Mahafaly. The people also began to manufacture iron spears, which they used to hunt wild animals. In contrast with the meat-based diet of the inland peoples, the coastal people adapted to a life of seasonal fishing and collecting from reefs, and lived almost entirely on seafood. Their communities were quite small compared with the inland villages (Parker-Pearson, 2010). Both types of communities became increasingly isolated during the 19th century, although the coastal communities were more isolated and continued to have almost no contact with traders and the outside world.

### 3.2.4 THE SOUTH MEETS EUROPE

In the 16th century, the peoples of the south first came in contact with European civilization when the first Portuguese explorers established a military outpost in an old stone structure called Tranovato between 1520 to 1530, founded upon vestiges from the Swahilis, and began to survey the southern coastline west of Fort Dauphin (Tolanaro). Oral and written histories still exist from that period, including histories of the Mahafaly and Tanosy kingdoms by the French governor Flacourt in 1661; and chronicles by the shipwrecked sailor and slave Drury in 1729, who lived in the Androy region.

During the 16th and 17th centuries, the peoples of the Deep South fought wars over land and formed royal dynasties. Settlements moved further inland and to higher, more defensible sites which were much drier than the rich lands of the southern valleys. With the wars came a huge increase in gun trafficking, internal migrations and territorial conquests (Drury, 1729; Flacourt, 1661). Guns and metals were initially traded with the French and other European merchants, although this led to a source of arms trafficking by local trading people with conflictive groups from elsewhere in the Deep South. The quality of pottery and the progressive lack of decoration and surface treatment during this period also indicates a possible change in the role of women (Parker-Pearson, 2010), as families are forced to become more mobile changing the daily routines for many households.



### 3.2.5 IDENTITIES AND RESISTANCE

The 17th century saw the solidification of many of the cultures and clan structures that are observed today, notably for the Tandroy. New crops were introduced, transhumance further declined, and various groups of people from the south began to move and settle further northwards with their herds. Families and their clans also start to drift from previous royal affiliations with the breakdown of regional dynasties. This separation process may, in part, explain the development of enormous family tombs across many parts of the Tandroy and Mahafaly lands.

During this period and for almost 200 years, inter-clan fighting was propagated in part by foreign merchants who provided guns, knives and metals in exchange for slaves and cattle. However, in many remote parts of the South there was little or no trade with Europeans. The semi-nomadic peoples of the Deep South proved resistant to the allures of the outside world, preferring their isolation until the 20th century, when French colonization, followed by independence, changed the political landscape once again.

### 3.2.6 POPULATIONS DISPERSE AND EVOLVE

Many populations across a large part of the Deep South were controlled and unified from the 16th century by the dynasty led by Zafiraminia who originated from the Tolanaro (Fort Dauphin) region in the southeast. This royal leader had two sons, Andriamanare and Andriamandraha, who later divided a large part of the Deep South into two regions following a dispute between themselves (SFCG, 2015). Based upon oral histories recorded by Emile Defoort in 1913 and Raymond Decary in 1930, the kingdom of Andriamanare became divided again and became a mosaic of kingdoms. In addition, subjects in the Deep South developed a precarious respect of dynastical leaders and often resisted submission. Although dynasties waned across the region, they managed to survive as important clan structures until the 19th century under the leader Roandriane (Defoort, 1913)

From about 1680 to 1880 while dynasties ruled, the number of settlements increased by about 150 percent; and in the 19th century the settlements grew in size and became comparable to the Manda settlements from the 10th to 13th century (Heurtebize, 1986). There was also exponential growth in the population during this period, possibly due to polygamy among the Tandroy, Merina and other peoples. This exponential growth led to more migrations, with many pastoralists and their cattle moving to a northern part of the Deep South to pastures located many kilometers away from their temporary camps. As families moved north to new camps, these sites developed over time into new villages (Heurtebize, 1986).

Populations across the southern regions have increased significantly since the latter part of the 20th century to the present. The Deep South villages are less isolated compared to the settlements of previous pioneering migrant families. The presence of humans and settlements are now seen across the region. Although remote areas still remain, notably in the central and northern parts of the Deep South

### 3.2.7 SYNTHESIS AND DISCUSSION

The populations of Madagascar had their origins in Africa and Austronesia. In the south, it appears from archaeological excavations that the first settlers were likely Swahili merchants from the East African coast who arrived more than 1000 years ago. The earliest signs of civilization were near the coast and river valleys. Trading between settlers and Swahili merchants went on for almost three centuries. Cattle were important for food, rituals and trading. However, as the structure of societies in the Deep South shifted inland and inward, the large civilizations declined and warfare and isolation took precedence over trade.

The importance of the sea and its marine resources also declined as communities moved inward, and pastoralists

developed taboos associated with the sea. However, the establishment of national infrastructure and investment in offshore fishing vessels may open up economic opportunities for the region through the development of fishery value chains (pers. com., Mahatante).

## 3.3 ISOLATION IN THE SOUTH INSTILLED THROUGH REBELLION SINCE DYNASTICAL, COLONIAL AND MODERN TIMES

### 3.3.1 RESISTING A KINGDOM AND COLONIAL EMPIRE

Profound changes occurred during the 18th and 19th centuries with the decline of the Sakalava kingdom in the west of Madagascar and the rise of the Merina people. The Sakalava has no direct link with the south at this time other than being a competitive regional force for the Merina people. Once the Sakalava became a lesser threat, the Merina people from 1830 made a series of attempts to incorporate the Androy region into their growing national empire. These unsuccessful efforts to conquer the Deep South were later followed by further attempts to oppress the peoples, this time by the French colonial governor, which partially failed.

In 1895 the French government officially began the colonizing of Madagascar after concluding a political agreement which allowed the British to take over the coastline of Zanzibar, on the other side of the Mozambique Channel, in return for no objections against the French moving into Madagascar. Later, the peoples of the Deep South held out against the French until 1901, when French soldiers and Senegalese recruits were sent to conquer the region by force. After defeating the local resistance, the French established administrative and commercial posts across the entire region. In 1903, however, there was a major rebellion in the western parts of the Deep South, which spread across the entire region (Brown, 1995). Many Malagasy soldiers who had been attached to colonial forces either deserted their posts or joined the revolt (Esoavelomandroso, 1985).

Later, from 1915 to 1917, there were other armed uprisings across the South and southwest by small groups known as the *sadiavehe*. These groups went on the offensive against French forces for attacking their villages and stealing cattle, and for imposing taxes, especially during periods of drought and food shortages (Esoavelomandroso, 1975). Attempts to suppress these uprisings backfired, as more locals joined the revolts.

Colonial administrators often compiled ethnographies depicting the people of the south and notably the Tandroy people. One author described the Tandroy as "backward and least acceptable to European civilization" and "quick to change their minds, perfidious and dissimulating" (Defoort, 1913). This view of the peoples of the south created distrust on both sides, which continues to be felt today.

### 3.3.2 INDEPENDENT MALAGASY STATE AND DISCRETION IN THE SOUTH

The 20th century saw the Deep South's gradual integration with the rest of the country, although as late as 1960, when independence was declared, Hubert Deschamps, a former colonial Administrator, observed that the Tandroy people, in particular, retained their attitude of isolationism, except for their participation in a major cattle market in the neighboring Fianarantsoa province. In recent years, however, trade is again constrained by the political and security situation in the region, with conflicts in some parts of the Deep South and in the northern reaches of the zone from Betioky across to the Betroka district.

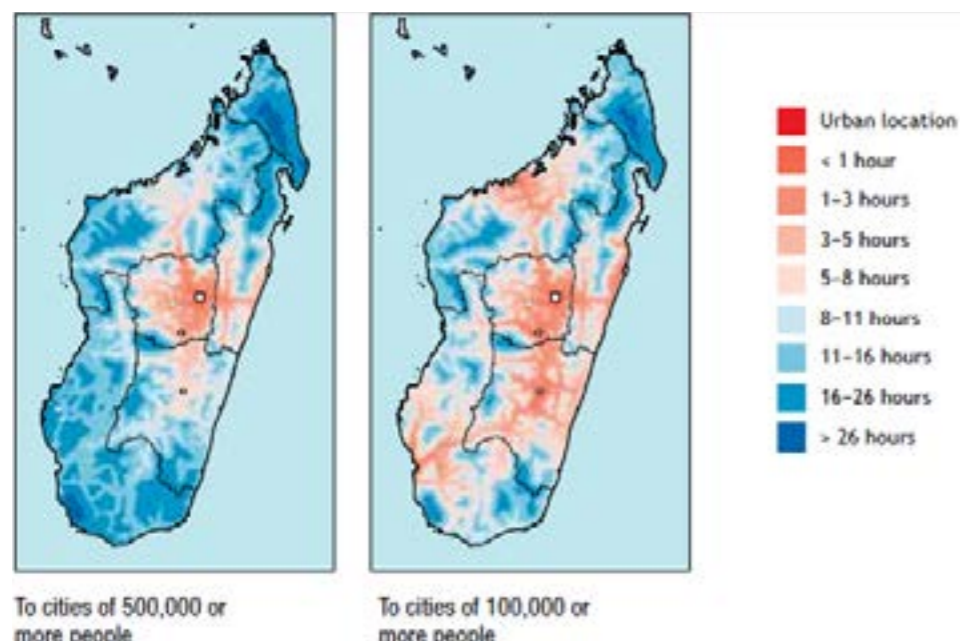
Independence was declared in 1960 after Philibert Tsiranana was elected by parliament as president of the First Republic with notable French government support. Subsequent analysis of the student riots of 1971 cite overt French interference

in the country, including in the education system (Brown, 1995), which gave the government the appearance of being a puppet regime. Also in 1971, an outbreak of anthrax in the Deep South and southwest region decimated herds of cattle. This disaster, followed by a prolonged drought, led to severe famine among the Tandroy and Mahafaly peoples. At the same time, the tax collectors, paid on a commission basis, were unrelenting in trying to collect taxes even on cattle that had died during the epidemic and the drought. A revolt led by a Malagasy Lutheran pastor resulted in the death of about a thousand people and the jailing of up to five thousand others (Brown, 1995). Afterward, government ministers toured the Deep South and issued pardons to those who had been involved in the revolt. Nevertheless, this event led to the downfall of President Tsiranana in 1972. Since that time, the leaders in the south have often been at loggerheads with national political leaders, which has played a part in the lack of development of the region.

### 3.3.3 ACCESS TO MARKETS AND TRANSPORT

The road network in the Deep South is very poor and not uniformly distributed, which means that access to markets in larger towns is slow and costly (Figure 3b). Extreme climate events such as flooding can also lead to increased transport costs.

Figure 3b: Access to markets in larger cities or towns



Source: Adapted from IFPRI, 2013

There has been little investment in the road network since colonial times (Figure 3c). There are no national roads in good condition, and the majority have never been tarred since their demarcation by the French. The only tarred road is the stretch of RN13 road from Fort Dauphin to Ambovombe; but it has been highly degraded for almost 20 years and has completely eroded away in many places. Due to recent changes in the political regime, the country lost funding for the development of the RN13 (Ihosa to Fort Dauphin), which has led the road to degrade even further and become more problematic and costly to rebuild. The RN10 (Ambovombe to Toliara) also has not been improved since colonial times.

Figure 3c: Road networks across the south



Source: FTM:1:500,000 scale regional maps, 1990

The secondary roads are of variable quality. They can be good in the sandy areas of the littoral zone and poor on undulating and clay soils, which may be prone to flooding and erosion. These roads have often been used for famine relief over recent decades. There is no applied regional road strategy, but often minor roads are restored by local peoples, as a means for donors and NGOs to provide cash the famine victims through High Intensity Workforces (HIMOs).

Generally, due to the sandy soils and dry weather, most trucks and four-wheel drive vehicles can move at a steady pace along the secondary roads. However, the backbone routes for regional and national trade, including the RN10, RN13 and RN12, are very poor and likely to damage vehicles, which increase the costs of maintenance and of transporting goods and passengers. In addition, as vehicles move slowly on main roads, they are at a higher risk of attack by bandits, notably on the northern sections of the RN13 and western sections of the RN10.

### 3.3.4 SYNTHESIS AND DISCUSSION

The identity of the peoples of the Deep South began to take shape in the 18th and 19th centuries through isolation and warfare to defend transhumance and their semi-nomadic existence with the cultural importance of zebu cattle. They traded among themselves and with foreigners near the coast, and took occasional shipwrecked sailors as highly prized slaves. A significant step towards quasi-independence began in the early 19th century, when the Tandroy defeated the Merina, who were attempting to pacify and unify the country.

Later, with the onset of French colonialism, the peoples of the Deep South again proved defiant, particularly against the tax system, which was imposed on non-monetary peoples whose wealth was often in cattle. Even after independence, a revolt over taxation may have led in part to the downfall of Madagascar's first president. The population also began to suffer more from drought and famine. In recent decades, the international community has assisted the south with aid programs, but these programs have not been accompanied by any kind of sustainable development strategy or programs to integrate the Deep South with the rest of the country.



## 3.4 INSECURITY, INSTABILITY AND BANDITRY EVOLVING FROM TRADITIONAL CATTLE THEFT TO ORGANIZED CRIME AND TERRORISM

### 3.4.1 INSTABILITY TO INSECURITY

This section explores the link between political instability and insecurity, with lawlessness and an ineffective state providing opportunities for rural banditry, armed criminality and recruitment by international terrorist organizations. These troubles are not new, but they have been exacerbated by the political crisis of 2009. The triad of a dysfunctional security sector, lack of a functioning state apparatus, and dynamic predatory actors are at the heart of the interrelated phenomena attached to insecurity (Jutersonke and Kartas, 2011).

### 3.4.2 CATTLE BANDITS AND INSECURITY

The political crisis of 2009 has had lasting effects. Large-scale cattle rustling in the Deep South has been increasing, orchestrated by politically influential people known as malaso col blanc (white collar bandits). In addition, national roads have become unsafe, and travel along certain sections, including the RN13 from Ihosy to Ambovombe, has to be done in convoy and sometimes escorted by the gendarmerie (Andriamarohasina, 2010). During 2016, several minibuses were attacked in northern sectors of the south known as zones rouges, or no-go zones, with reported fatalities. The zones rouges encompass large areas of the Deep South that are often inaccessible to security personnel due to rough terrain and a fragmented road network. These areas are also difficult to reach for disaster relief.

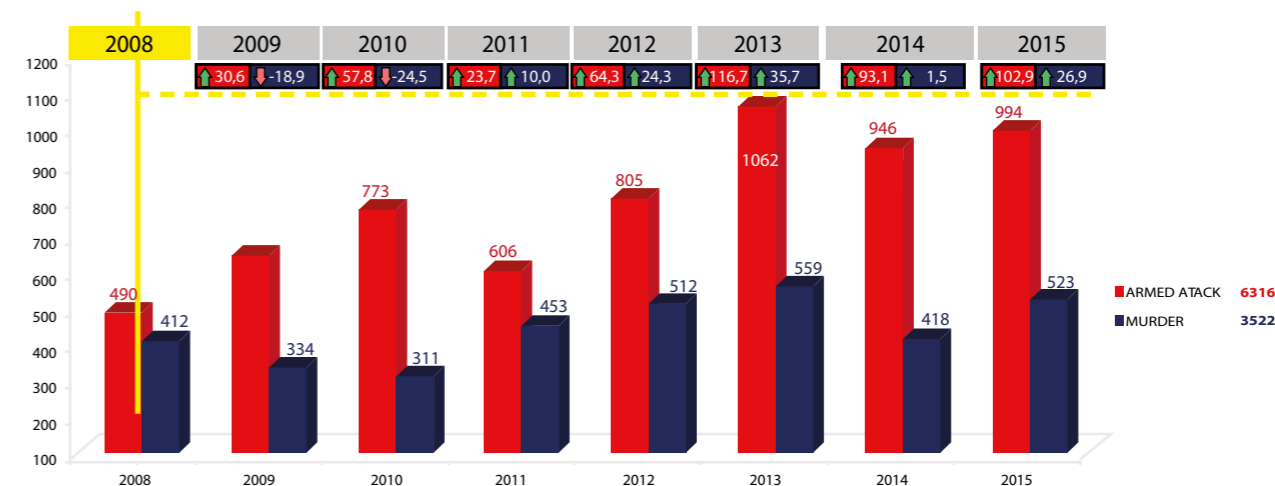
The most persistent source of insecurity in the Deep South is cattle rustling. In 2001, an estimated 1.78 zebus were stolen per week per commune, equivalent to 130,000 stolen zebus per year across the country (Fafchamps & Minten, 2004). These numbers correspond with the large populations of zebu cattle in the western savannah grasslands of Madagascar and the Deep South. It also appears that the malaso phenomenon involves collusion with some elements of the armed forces and organized crime (Madagascar Tribune, 2010; Jutersonke and Kartas, 2011).

### 3.4.3 MALASO AND ORGANISED CRIME

Some have argued that the activities of the malaso (bandits) constitute a ritualized form of cattle raiding associated with young men's traditional rites of passage. However, cattle theft has become more associated with organized crime over the years due to the insecurity in rural areas, which has enabled to malaso to falsify documentation of cattle, hide large numbers of cattle among the herds of wealthy cattle barons, and organize the eventual transportation of animals across the country (McNair, 2008; Fauroux, 1989). Crime syndicates are also responsible for the circulation of weapons, principally AK-47s (Madagascar Tribune, 2010). Therefore, it is likely that some members of the security forces are working in collaboration with the malaso (Jutersonke and Kartas, 2011). In the south, the cattle theft rings sometimes also take women and children as hostages and burn down their victims' houses (Madagascar Tribune, 2010).

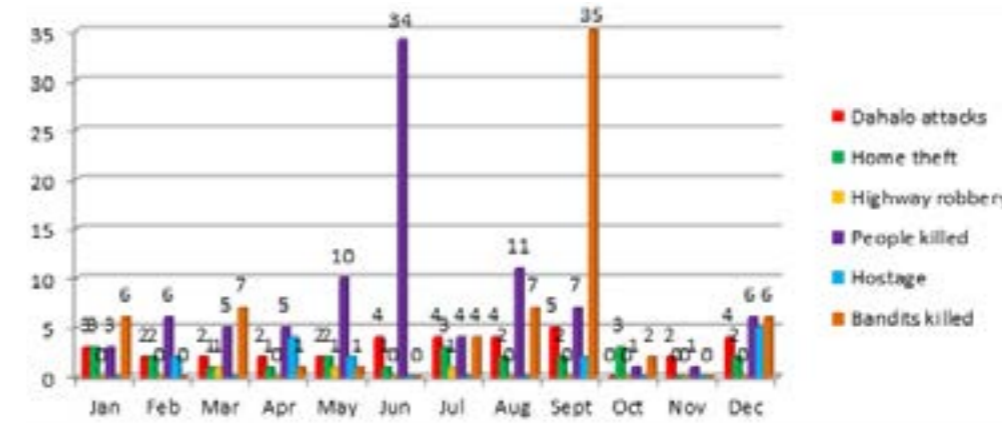
The main impediment to reducing the number of cattle raids is the lack of policing, including investigative capacity and means of transportation for the security forces. None of the gendarmerie outposts have access to helicopters and few have functioning vehicles (Jutersonke and Kartas, 2011). The larger problem, however, is a lack of political will to act against the power and influence of the malaso col blanc (white collar bandit).

Figure 3d: Evolution of crime trends in Madagascar for 2008-2015



Source: Group 4 Security (G4S), Madagascar, 2016.

Figure 3e: Monthly trends for various crimes for three southern regions during 2015



Source: G4S Security Madagascar, 2016.

### 3.4.4 RECRUITING FOR TERRORISM

Since 2015, UNDP and Interpol have been monitoring infiltration into the country by extreme Islamic organizations. There has been an increase in foreign imams visiting parts of the Deep South and southeast and the construction of new mosques by outsiders; and an arms cache was discovered in an isolated part of the Deep South. The objective of the groups is to recruit potential collaborators from poor communities in Madagascar including the Deep South (pers. com. UNDP). In 2016, there were reports in the local media of the arrests of several imams in the southeast, who were deported from the country (Gazette de la Grande Ile, 2016).

### 3.4.5 SYNTHESIS AND DISCUSSION

Cattle theft has long been an issue in the Deep South. This situation has been aggravated by political instability and the establishment of partially foreign-owned abattoirs, which buy and butcher stolen cattle for export.

In an effort to counter the problem of insecurity, the state administration has encouraged the organization of village self-defence groups and has tolerated the efforts of indigenous private security companies to hunt down the malaso. These retributive responses to banditry have caused escalating violence by the malaso and dramatically

increased the trafficking in weapons (Jutersonke and Kartas, 2011).

In 2014, the Government initiated a reconciliation process in which about 4000 malaso gave up their arms and promised to become security forces to protect the villages and provide safe passage for humanitarian workers in isolated regions. The international community, including UNDP, is supporting the reconciliation with aid programs to assist their transition to a normal life (Madagascar Tribune, 2014). The EU's Amélioration de la Sécurité Alimentaire et Augmentation des Revenus Agricoles (ASARA) program has classified the former malaso as "vulnerable persons" so they can receive targeted support through agriculture projects. However, their special treatment has been perceived as unfair by many in the Deep South who also need assistance. In addition, some of the security forces have been accused of human rights violations by Amnesty International in relation to their responses to malaso. There is also concern that the converted malaso could return to banditry if there is a regime change or if support from the international community is revoked.

In addition to concerns about the malaso, communities in the Deep South also feel threatened sometimes by the village security groups or jado, particularly in the districts of Betsiky and Ampanihy. In these areas, many communes have applied local customary law, or dina be, to punish bandits. Ironically due to the effectiveness of dina be, the jado have turned to racketeering and extortion to extract money from the villagers. The unstable political environment in the Deep South has also created opportunities for terrorism recruiting, which, combined with banditry and corruption, threatens the development of all of Madagascar as well as other countries.

This instability has caused the UNDSS to restrict all UN missions except critical missions, which must be carried out by air.

## 3.5 CLIMATE CHANGE: DROUGHTS, IRREGULAR RAINFALL AND IMPACTS

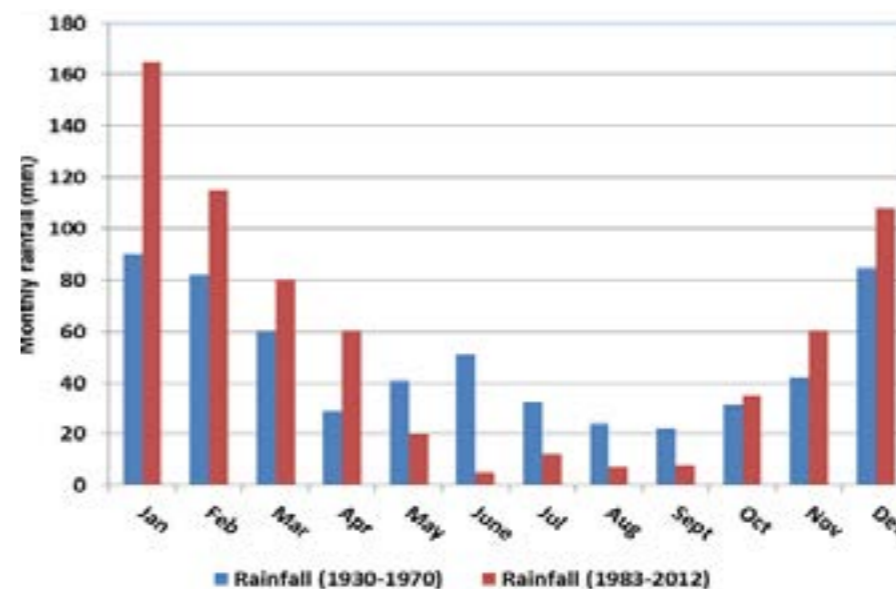
### 3.5.1 PAST AND PRESENT CLIMATIC OBSERVATIONS

#### Rainfall

The average annual rainfall in the Deep South has been declining over the last century and has much lower rainfall than other parts of the country, notably to the north and east. The most recent data set for 1983-2012 shows a typical dry tropical pattern, with a rainy season between December and March, transitory months between April and November, and a well-define dry season between May and September (Figure 3f). During the rainy season, monthly rainfall ranges between 80 and 160 mm, while during the dry season, it stays below 20 mm. By contrast, the data for 1930-1970 period show a more moderate rainy season of 60 to 90 mm per month, and rainfall throughout the dryer season of 20 to 60 mm per month. This was due to the influence of cooler and wetter masses of air coming from the southern part of the globe.



Figure 3f: Monthly rainfall for Ambovombe weather station (1930-1970 and 1983-2012)



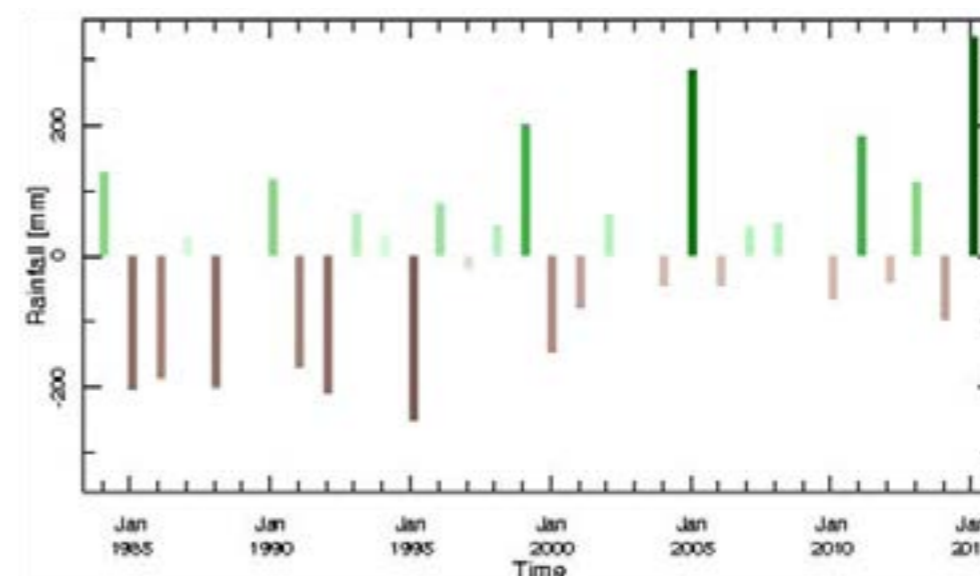
Source: Chaperon et al., 1993. Fleuves et rivières de Madagascar. ORSTOM Editions ; and <http://map.meteomadagascar.mg/> Direction Générale de la Météorologie, Madagascar, 2016.

Figures 3g and 3h show the anomalies for rainfall in the south (difference between total rainfall observed each year and the average rainfall for the considered season) for the rainy season (December to March) and the dry season (May to October). The data shows that:

- wet seasons seem to have had more precipitations in recent years (2000 to 2015) than previously years (1983 – 2000) ;
- dry seasons show cycles of drier or wetter years where rainfalls were clearly above average before 1990, while during the past 10 years there have been more incidences of dry years compared to the past.

As mentioned previously, climate change is predicted to cause more severe droughts and variable rainfall patterns, which could be a probable reason for recent recorded changes.

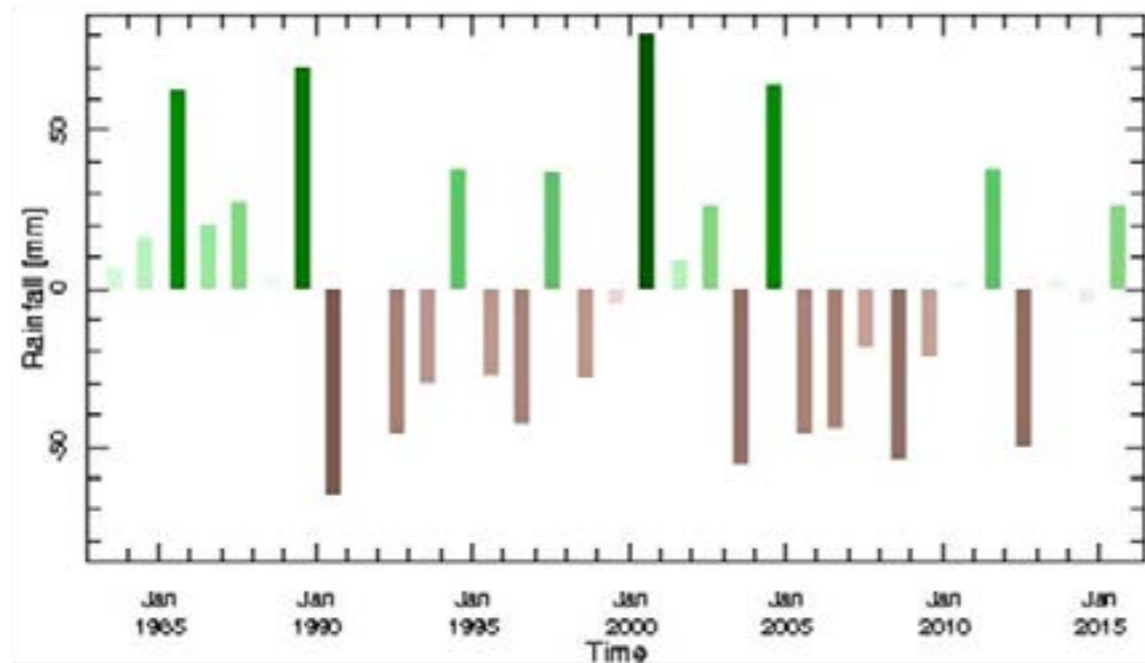
Figure 3g: Anomalies of rainfall for the rainy season (December to March)



Source: <http://map.meteomadagascar.mg/> Direction Générale de la Météorologie, Madagascar, 2016



Figure 3h: Variations of rainfall above/below average for the rainy season (May to October)

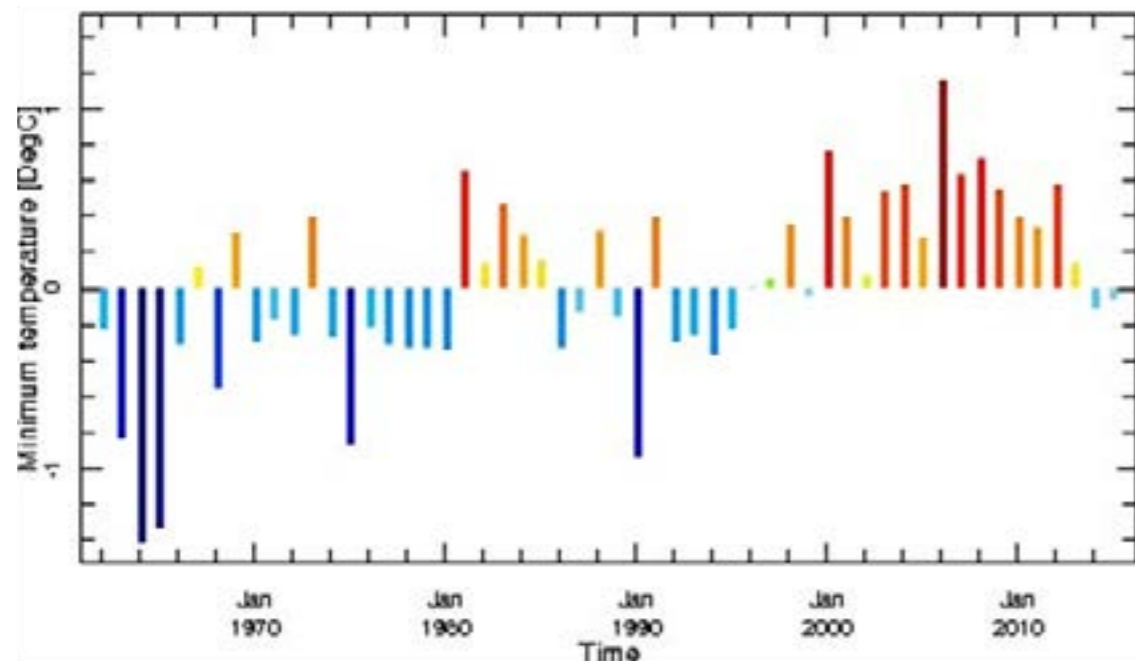


Source: <http://map.meteomadagascar.mg/> Direction Générale de la Météorologie, Madagascar, 2016.

**Temperature**

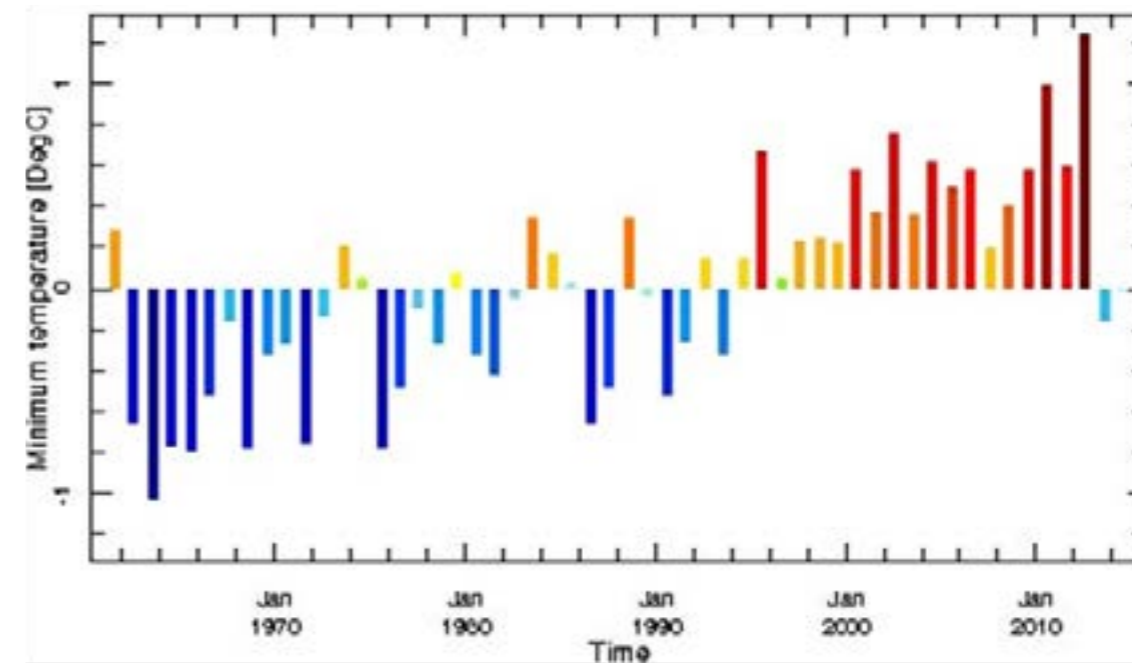
The wet season is generally warm, with temperatures between 20°C and 35°C (68°F and 95°F), while the dry season is much cooler, with temperatures between 14°C and 25°C (57 °F and 77°F) in the Deep South. Due to global warming, average temperatures for both the dry and rainy seasons have clearly increased over the past 15 years (figures 3i and 3j).

Figure 3i: Anomalies of minimum temperatures for the rainy season (December to March)



Source: <http://map.meteomadagascar.mg/> Direction Générale de la Météorologie, 2016

Figure 3j: Anomalies of minimum temperatures for the dry season (May to October)



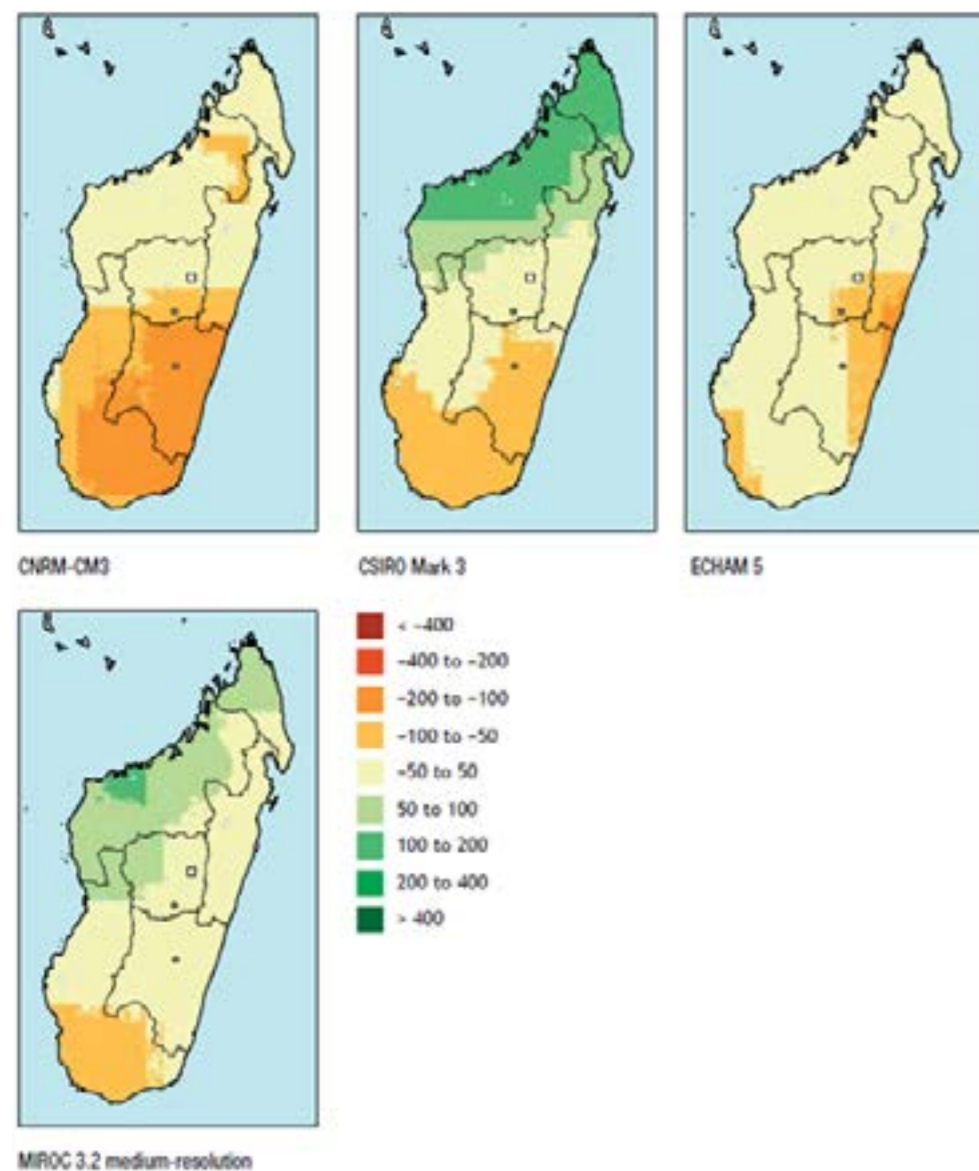
Source: <http://map.meteomadagascar.mg/> Direction Générale de la Météorologie, 2016

**3.5.2 PREDICATIONS FOR CLIMATE CHANGE ACROSS MADAGASCAR AND THE DEEP SOUTH**

Numerous models and climate scenarios were developed by IPCC in 2007 in its Fourth Assessment Report (AR4). The A1B scenario is used in this study based upon the choice and calculations of IFPRI in 2013. Scenario A1B was selected as it primarily concerns the climate changes between now and 2050 relating to biophysical effects upon crop yields. Figures 3k and 3l show four downscaled climate models for the A1B scenario. In addition this scenario is based on greenhouse gas emissions and assumes fast economic growth and a population that peaks during the forthcoming mid-century and the development of new and efficient technologies, along with a balanced use of energy resources.

Figure 3k shows projected precipitation changes for various models. For the southern parts of the country, rainfall either remains relatively unchanged or decreases. Reduced rainfall has consequences for agricultural production, where a lower amount of rainfall could mean reduced production of crops eaten in the Deep South, such as manioc. In short, without adaptive options, the future is likely to see increases in food insecurity.

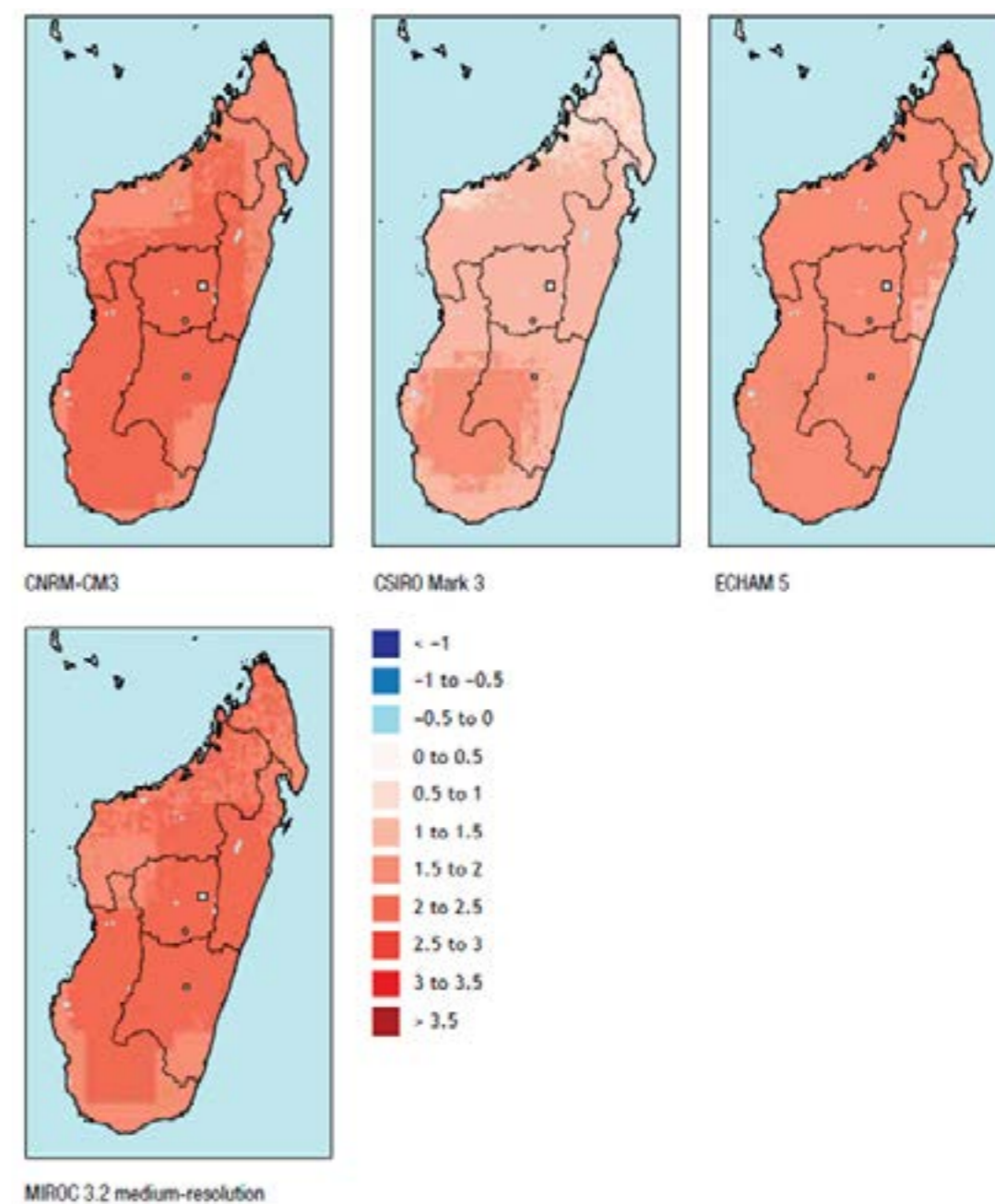
Figure 3k: Changes in mean annual precipitation (mm) in Madagascar for 2000–2050 based on 4 models



Source: IFPRI, 2013; and calculations based on Jones, Thornton, and Heinke, 2009.  
 Notes: CNRM-CM3 = National Meteorological Research Center–Climate Model 3; CSIRO = climate model developed at the Australia Commonwealth Scientific and Industrial Research Organisation; ECHAM 5 = fifth-generation climate model developed at the Max Planck Institute for Meteorology (Hamburg); GCM = general circulation model; MIROC = Model for Interdisciplinary Research on Climate, developed by the University of Tokyo Center for Climate System Research.

Figure 3l shows increases in temperature ranging from 0.5° to 3°C (33°F to 37°F) throughout the country for various models. These predictions include ranges for the Deep South of 1°C to 3°C (36°F). These potentially higher temperatures would promote evapotranspiration, thus reducing soil moisture and increasing soil degradation. High temperatures may also promote an increase in pests and diseases, as in the case of manioc mosaic disease, which is a very important crop for the Deep South, and whose virus multiplies under higher temperatures.

Figure 3l: Changes in monthly mean maximum daily temperature (°C) in Madagascar for the warmest month for 2000–2050



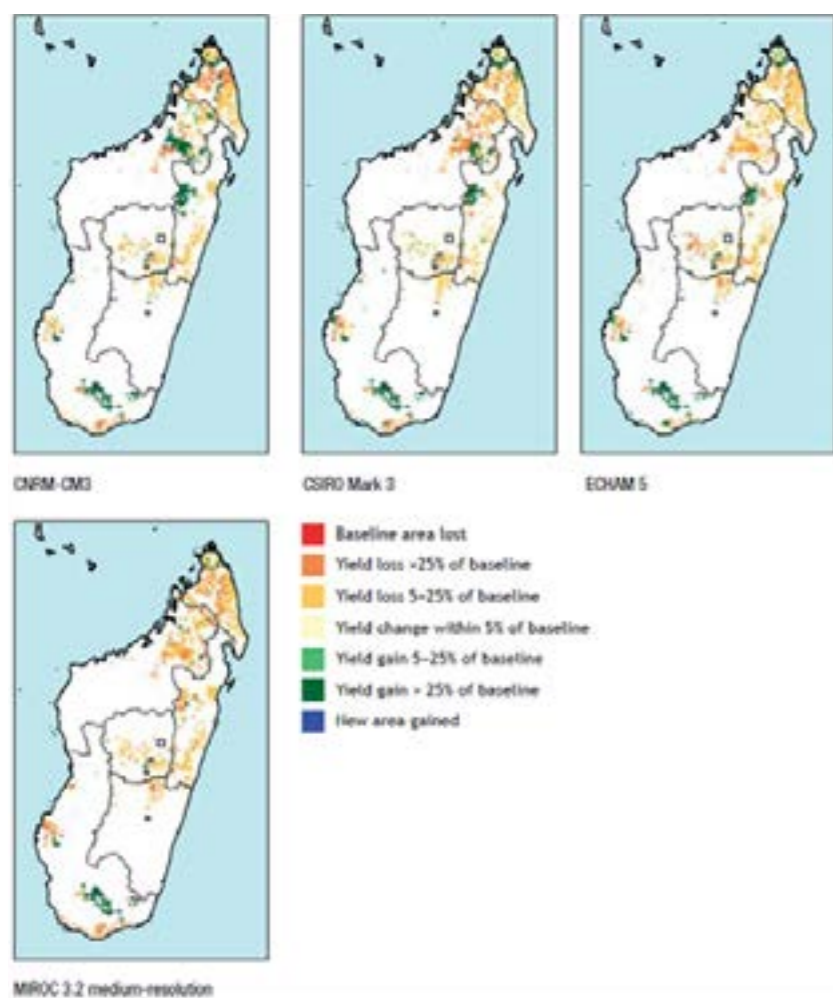
Source: IFPRI, 2013; and calculations based on Jones, Thornton, and Heinke, 2009.  
 Notes: CNRM-CM3 = National Meteorological Research Center–Climate Model 3; CSIRO = climate model developed at the Australia Commonwealth Scientific and Industrial Research Organisation; ECHAM 5 = fifth-generation climate model developed at the Max Planck Institute for Meteorology (Hamburg); GCM = general circulation model; MIROC = Model for Interdisciplinary Research on Climate, developed by the University of Tokyo Center for Climate System Research.



### 3.5.3 CROP CHANGES

The Decision Support System for Agrotechnology Transfer software was used to compute yields under climatic conditions of 2000 and (projected) 2050. Figure 3m shows scattered gains in maize yield in all of the models in the wetter northern zones of the Deep South. In all of these models, however, overall losses are greater than gains, reaching up to 25 percent in some areas. Maize has been the preferred crop in the Deep South since it was introduced as food aid in the 1980s, to compensate for the shortage of sorghum, the former traditional crop of the Deep South. However, there is a severe risk that production of maize in the future will fall drastically in littoral zones, including the fertile areas from Tsiombe to Ambovombe, and may force a return to the cultivation of sorghum and other dryland crops in these areas due to drought risks (Figure 3n). This would be a positive change given the demands for water from maize cropping.

Figure 3m: Yield change under climate change for irrigated maize in Madagascar from 2000 to 2050 using the A1B scenario

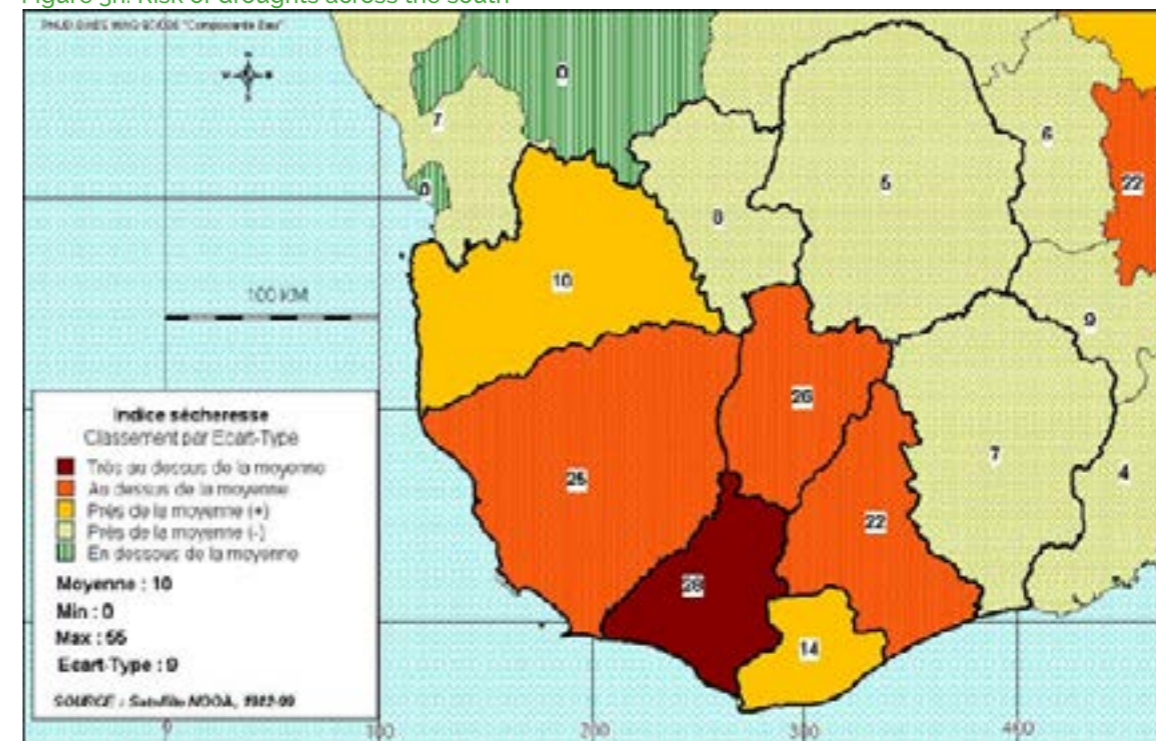


Source: IFPRI, 2013.

Notes: A1B - greenhouse gas emissions scenario that assumes fast economic growth, a population that peaks mid century, and the development of new and efficient technologies, along with a balanced use of energy sources; CNRM-CM3 - National Meteorological Research Center–Climate Model 3; CSIRO - climate model developed at the Australia Commonwealth Scientific and Industrial Research Organisation; ECHAM 5 - fifth-generation climate model developed at the Max Planck Institute for Meteorology (Hamburg); GCM - general circulation model; MIROC - Model for Interdisciplinary Research on Climate, developed by the University of Tokyo Center for Climate System

Research.

Figure 3n: Risk of droughts across the south



Source: NOAA Satellite data for 1982-90 ; Schéma Directeur de Mise en Valeur des Ressources en Eau du Grand Sud de Madagascar, 2003.

Notes: Reddish brown=high risk, orange= medium risk, yellowish gold= just above average, light green= just below average, dark green= below average.

### 3.5.4 SYNTHESIS AND DISCUSSION

Existing data suggest that rainfall is increasingly concentrated during the months of December to March, and has decreased significantly during the dry season. These prolonged periods of higher temperatures have led to higher evaporation rates, which, combined with fewer days of rain, may in the future result in more severe droughts and harsher conditions for water management for domestic use, livestock and agriculture.

These changes in rainfall and temperature are highly problematic for farmers. In focus groups, farmers agreed that they will inevitably have to switch from maize to manioc, sorghum and beans, which require less water. Some NGO and EU programs are currently working to reintroduce improved varieties of sorghum that do not attract birds, although some farmers are not satisfied with those efforts. Further, due to the lack of availability of quality seeds, local NGOs in the south cannot always support planting by farming communities during periods of famine, as observed during the famine of 2015-2016.

Agricultural adaptations and changes will need to happen in the Deep South on a commercial scale, through the coordinated efforts of communities, the government, and potential private suppliers. Food production systems, including irrigation schemes, could include groups of farmers, larger commercial units or leasing schemes, and may require the diversification of lands currently used for sisal production.

## 3.6 RELATIONSHIPS BETWEEN PEOPLE, LIVESTOCK AND ACCESS TO WATER

### 3.6.1 FROM WATER RICH VALLEYS TO DRIER INLAND FORESTS

Due to periods of instability during the 16th and 17th centuries, settlements in river valleys shifted to more isolated areas further inland and towards the north. These new locations were less vulnerable and had a lower incidence of water-borne diseases such as malaria. At the same time, the settlements no longer had access to plentiful water resources. Instead, water resources were seasonal; water points were scarce during the long dry season, and ponds and rivers were recharged only during the rainy season. Sites for hand-dug wells to tap into groundwater were also limited. Most wells were then located near the future colonial town of Ambovombe and above the southern ridge of the plateau between the villages Montefeno and Anjampenorora (Parker-Pearson, 2010).

Following the shift to the drylands, water collection became a major household duty for women, who were obliged to walk for hours to distant water points and return carrying heavy jugs of water. In addition, the women collected and chopped firewood, made fires and cooked meals, tended some crops in fields, and cared for their younger offspring. Men had fewer onerous duties at that time, such as the herding of zebu cattle.

### 3.6.2 DEEP SOUTH DISCOVERS FAMINE

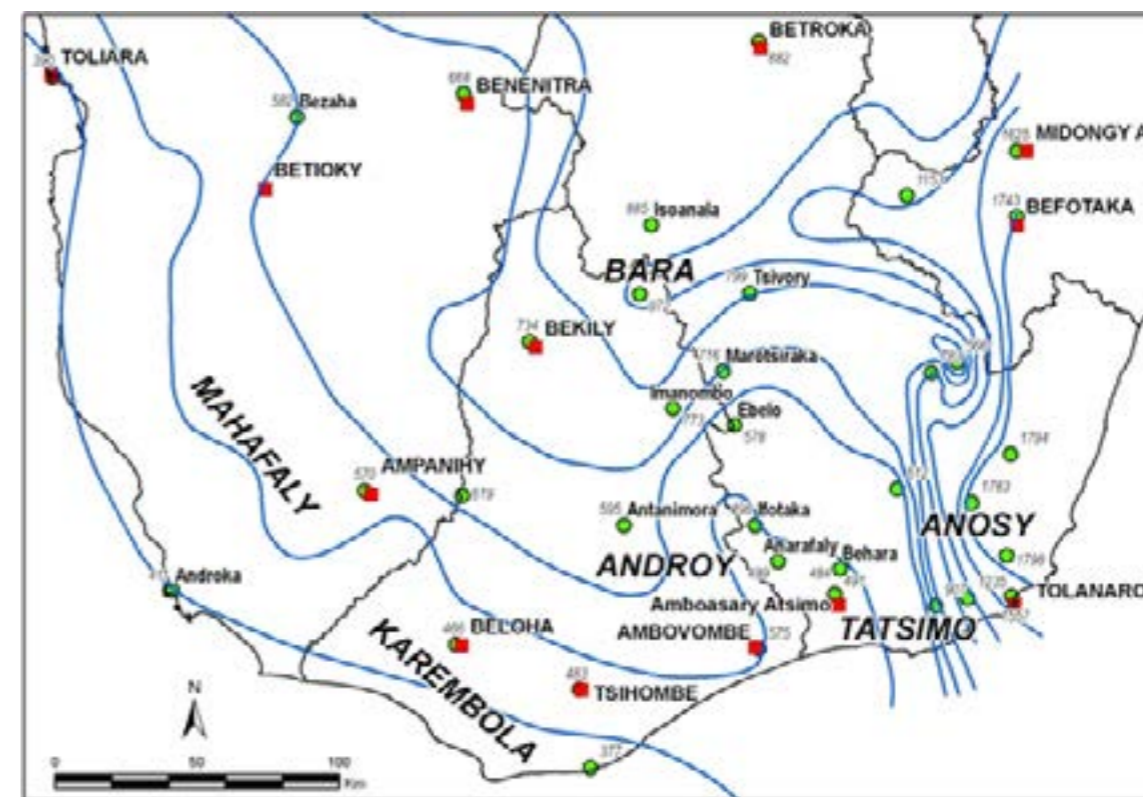
As the population began to increase significantly in the drylands in the 18th and 19th centuries, some families returned to the former settlement areas near river valleys and the coast in the southern parts of the Deep South, as water was scarce inland and instability was no longer a threat. More sedentary agriculture began to develop in fertile valleys during the French colonial period of the early 20th century. Then Malagasy farmers copied colonials and planted cactus around their villages as a form of defence against and to assist ambushes upon French forces and tax collectors. The French colonial powers then introduced cochineal beetles to attack the cactus plants that had formed a defensive perimeter around the villages across the Deep South. However the cactus had by then become an important reserve of food supplies, and by default the elimination of cactus provoked famine. During the famine of 1930, many thousands of livestock and about 60,000 people died across the region. Some areas lost up to half their population. The French Colonial Administrator in the Deep South severely underreported these figures (Middleton, 1999).

Following the famine, many Tandroy and others left the south and established communities in different parts of the country. Emigration from the south had, until that time, been limited mainly to men recruited by the French for military service within Madagascar and in the French territory of La Réunion. In the years after the famine, however, there was a mass migration to the north, with 40,000 people leaving the Androy region in 1931 alone, and another 70,000 leaving after the famine of 1943-44 (Frère, 1958). There was also significant migration in the 1950s to the northern dry and spiny forest reaches of the Androy region, and significant numbers of villages moved towards the small town of Bekily in a remote area of the central Deep South (Frère, 1958). Most of the migrants were young men in their twenties who hoped to make their fortunes, although many ended up working as agricultural laborers, or as guards or *pousse-pousse* drivers, who earned a living but remained relatively poor without their former communities. Even with poor remuneration, most were able to send some money back to their families in the south, and sometimes contribute to lavish funerals or tombs.

Migrations from the Deep South included large movements of people to Nosy Be, in the northwest of the country. The population of the small island was estimated in 1954, after the famines, to be about 24 percent Tandroy (Frère, 1958), most of whom were laborers working on the island's sugar cane plantation. The effects of these migrations are still apparent today, with southern communities maintaining their identities in numerous villages on Nosy Be and elsewhere throughout the country, as the Tandroy culture, in particular, is very strong.

### 3.6.3 WHERE IS THE WATER NOW?

Rainfall patterns in the Deep South range from approximately 300 to 600mm between the littoral zone and the near hinterlands of Antanimora, Tsiombe and Ambovombe; and 800-900mm further inland as far as Tsimory. The heavy rains of 1500mm on the southeast coast around Fort Dauphin are effectively prevented from reaching these semi-arid regions by the Anosyenne Mountains, which create a rainshadow effect. The isohyet map for the Deep South (Figure 30) is an extract from a national map composed of average rainfall figures in millimetres from numerous weather stations across the entire country for periods of between 20 and 32 years prior to 1993 (Chaperon et al, 1993).



Adapted from : Fleuves et Rivières de Madagascar, Chaperon et al., 1993.

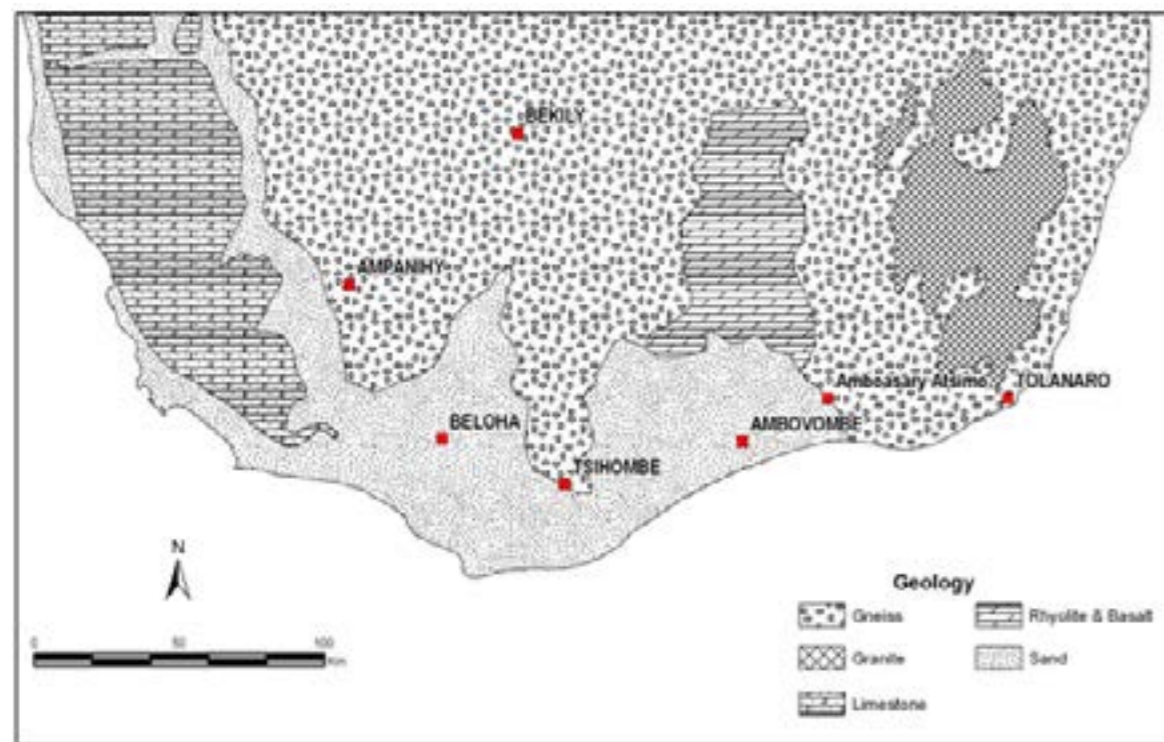
Low rainfall in the Deep South is compounded by its unpredictability, creating a landscape under semi-permanent climatic stress. There may be little or no rain during certain years; or the rains may occur outside the normal rainy season. These erratic processes provoke droughts and important losses of agricultural crops. When unpredictable rains do fall, as they did in July 2016 due to abnormal weather patterns from El Niño, farmers desperately cultivate their land and plant. However, the crops will often not survive, as no further rains are likely before the end of the year. Other extremes are also possible, including excessive rains and floods from passing tropical cyclones. These events are likely to increase with climate change. Meanwhile, older people have observed the weather become



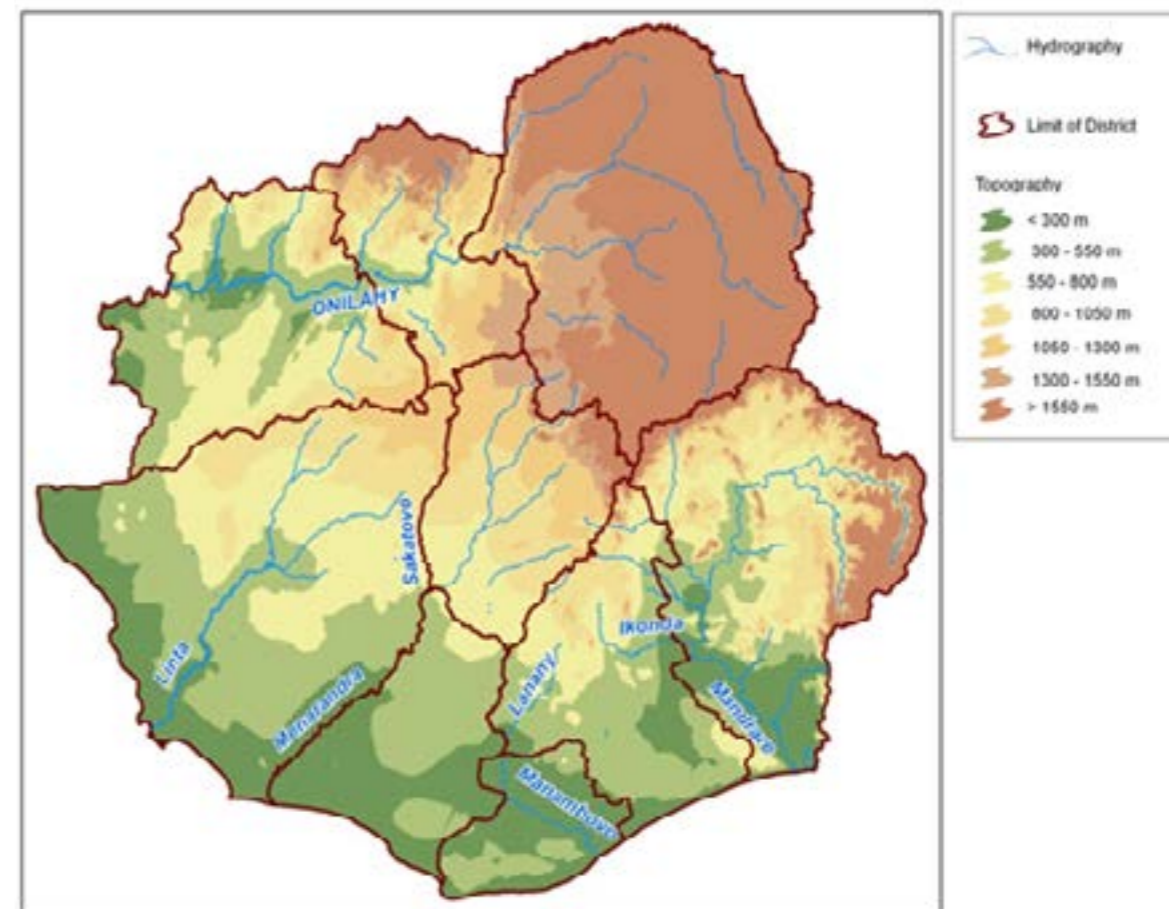
more erratic during their lifetimes.

The hydrographical and geological system across the Deep South (Figures 3p & 3q) can be divided into three principal types of regions (Aldegheri, 1972):

- River systems:
  - the Mandrare, within a catchment of 12,570 km<sup>2</sup> located in the east and rising from the continuously rainfed Anoyssenne Mountains; this river never runs dry;
  - the Manambovo, supplied by a small catchment of 4,450 km<sup>2</sup>, which is an aquifer rich in groundwater; this river flows from a crystalline basin to the north, but its waters are at the surface for only four to six months of the year;
  - the Menarandra, attached to a catchment of 8,350 km<sup>2</sup>; this river is often dry and flows through a crystalline basin onto limestone rock before reaching the sea;
  - Linta, associated with a catchment of 5,800 km<sup>2</sup>; this flows for approximately 6 months of the year.
- The calcareous Mahafaly plateau in the far west of the region; the plateau is devoid of rivers and surface water, but its relatively important groundwater supplies are accessible to people and livestock via numerous sink holes throughout the area;
- Internal drainage systems flowing into dune systems and the interior of littoral zones; in addition, the Ampamalora depression, the Ambovombe basin and the Beloha depression provide water in temporary ponds following storms.



Source: National Geological Maps of Madagascar (simplified).



Source: FTM:1:500,000 scale regional maps, 1990

During the dry season and parts of the wet season, the riverbeds or sandy banks of the river systems are pot-holed with shallow wells. During the wet season and following flash floods, the flood plains and sandy banks become littered with pools of water used by local people and domestic animals. Rainwater also collects naturally in small clay-lined pools and dips in the roads, which is carried back to settlements in buckets. This surface water is often full of bacteria that can spread disease. Those who have the means will buy their drinking water. Due to climate change, many sources are becoming dry and the prices for basic drinking water are rising.

In general, deeper groundwater is preferable (see Figure 3r). Overall, it is desirable to focus on sites with water below 40m to avoid local pollution, although water at depths of 20 to 25m is less costly to pump as shallower groundwater requires less drilling and offers the possibilities of using less costly solar pumps. Deep water supplies require expensive drilling operations and may also require expensive and stronger pumps powered with generators. Deep areas include the littoral zones of the south, northern parts of the Anosy region and parts of the Mahafaly plateau zone. Unfortunately the zones with deep and potentially costly groundwater supplies include villages which



are often hit by periods of drought and famine.

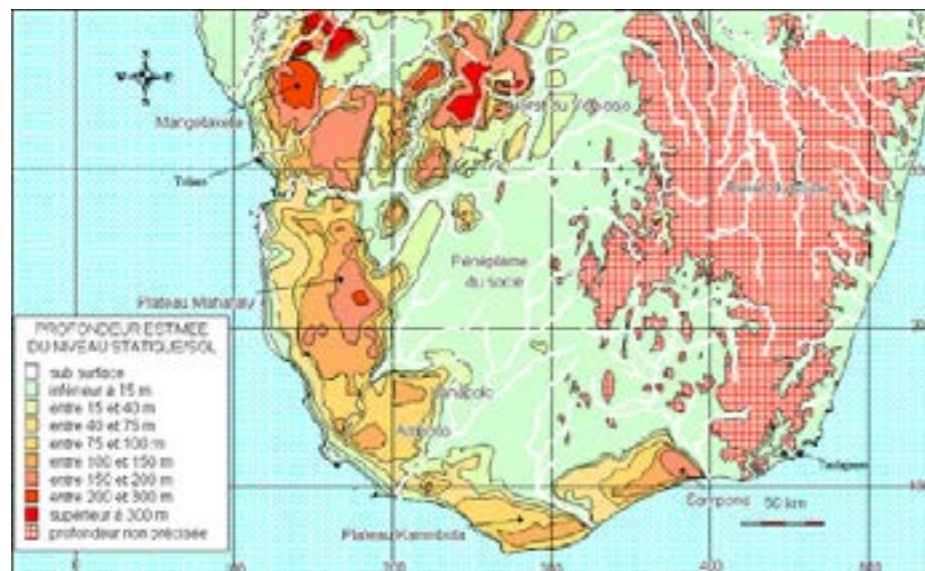
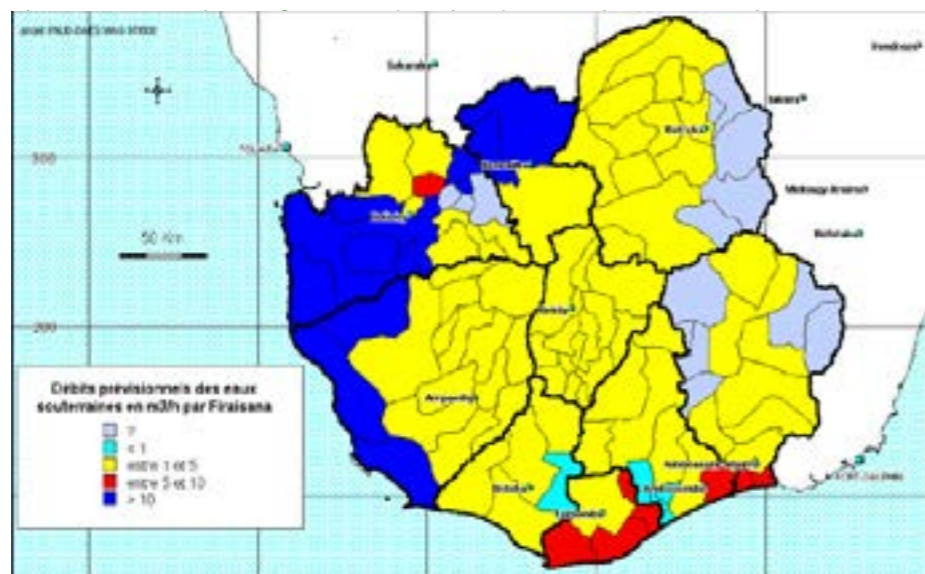


Figure 3r: Depth of groundwater in metres across the Deep South

Source: Schéma Directeur de Mise en Valeur des Ressources en Eau du Grand Sud de Madagascar, 2003.

Note: Watercourses are indicated with white lines.

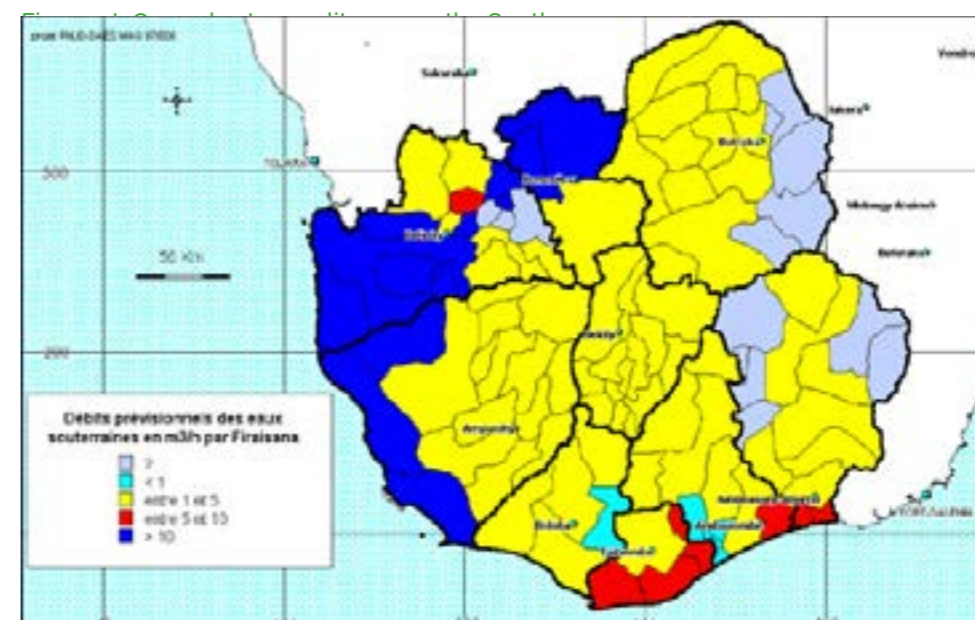
The groundwater flow rate is often measured with pump tests to determine whether a borehole and pump system could be viable. The best zones for flow are principally in the littoral zones as water flows downward and through aquifers from the hinterland and higher reaches within water catchments. Notable areas in the littoral and coastal zones are south of Tsiombe and Amboasary Atsimo; near the lower basins of the Manambovo and Mandrare rivers; the lower catchment of the Linta River; and the Mahafaly plateau (indicated in red and blue in Figure 3s).



Source: Schéma Directeur de Mise en Valeur des Ressources en Eau du Grand Sud de Madagascar, 2003.

Notes : Grey(?)- no data available, blue- <1 m<sup>3</sup>/hour, yellow- 1 to 5 m<sup>3</sup>/hour, red- 5 to 10 m<sup>3</sup>/hour, blue- >10 m<sup>3</sup>/hour.

The water along the coast and littoral zones from Beloha in the west to Amboasary is often of poor quality due to salty deposits (shown in red in Figure 3t). Further inland and in deep aquifers the water is variable (shown in yellow), which means a borehole or well at a particular site might or might not be salty. Therefore, drilling in these areas could be a costly exercise if not planned carefully. The best quality water (shown in blue) is in the coastal limestone zone associated with the Linta River and on the Mahafaly plateau.



Source: Schéma Directeur de Mise en Valeur des Ressources en Eau du Grand Sud de Madagascar, 2003.

Notes: Grey/brown(?)- no data available, Good-blue, bad-red, green-average, yellow-variable.

It is clear that systems are needed for reliable and good-quality potable water supplies for the entire region. The need for reliable surface waters is most urgent in the eastern part of the south. Any development or improvement of existing infrastructure needs to take account of the specific characteristics of groundwater resources in different areas. The equipment and sites will require careful planning to determine how best to use new or existing water networks, such as local and regional pipelines, including infrastructure for irrigation. Planning and implementing the network of pipelines, pumps and water distribution systems will require good management at both the regional and local levels, which has not been the case in the past (Marcus, 2007) This situation hampers efforts during periods of drought and famine, when water may not reach potential beneficiaries via different distribution systems.

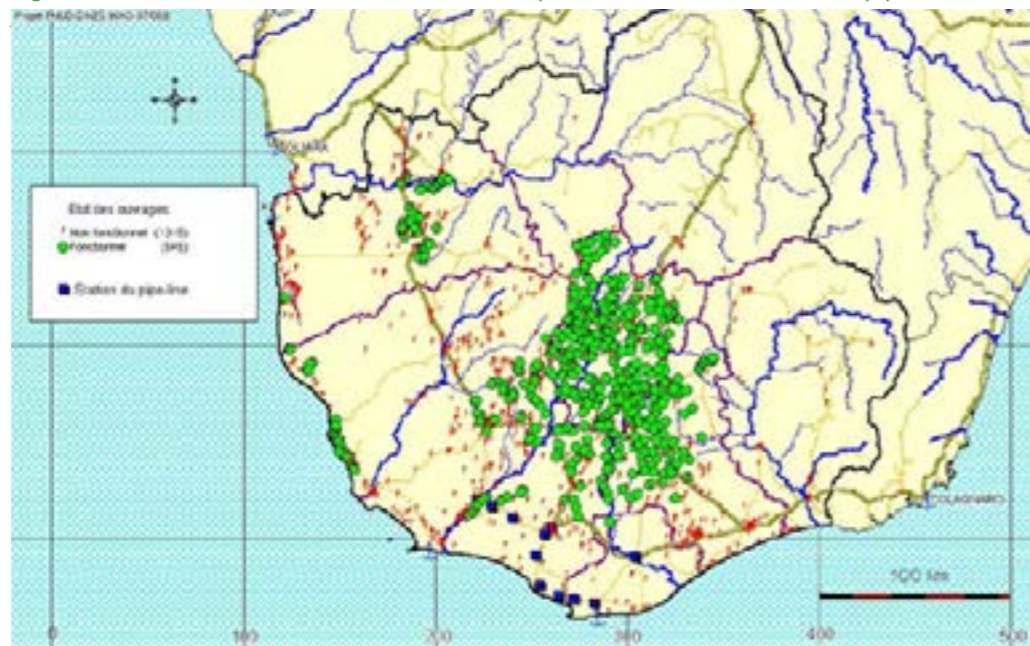
### 3.6.4 FAILED AND REMNANT WATER POINTS

In 2002, there were 545 functional waterpoints in the south out of a total of 1860 (Figure 3u), representing 29 percent of the sites and covering only 20 percent of the population (ANEA, 2003). In 2014, UNICEF, working with the Ministry of Water, began to rehabilitate 550 waterpoints. In addition, the water stations and pipeline were in a poor state, as there had been limited investment in public infrastructure for many years, and zero investment following the 2009 coup, it is likely that the number of functional water points may still be insufficient, although no updated figures of working waterpoints and other infrastructure are available, as the data had not been collected (pers. com., UNICEF). The situation in Tsiombe is typical of poor water infrastructure, where inhabitants with money prefer to buy water



transported by truck, while the poorer majority collect water from a nearby riverbed (pers. com., FJKM Church, Tsiombe).

Figure 3u: Functional and non-functional waterpoints and water stations on pipeline from Marilinta (Linta River)



Source: Schéma Directeur de Mise en Valeur des Ressources en Eau du Grand Sud de Madagascar, 2003.

Notes: Reddish brown points- non-functional waterpoints, green dots- functional water-points, blue squares- water stations on Menarandra River pipeline and Ambovombe system

Some principal potable water and sanitation projects since 1960 include:

- Operation ANDROY
- Fonds d'Intervention pour le Développement – World Bank
- Relance du Sud – European Union
- Programme Assainissement, soins primaire de l'Environnement (AEPSE)
- Programme d'alimentation en eau dans le Sud de Madagascar – Alimentation en Eau dans le Sud (AES) with African Development Bank (BAD)
- Programme MAG/98/008 Composante Gestion intégrée des ressources en eau dans le Grand Sud – United Nations
- Projet Pilot d'Alimentation en Eau Potable et Assainissement en milieu Rural (PAEPAR) – World Bank
- Projet 700 Forages (boreholes) – African Development Bank (BAD)
- Projet 150 & 500 Forages (boreholes) and 2014 ongoing rehabilitation – UNICEF.

In addition, some principal production projects (water management infrastructure including waterpoints) since 1960 have included the following:

- Projet de mise en valeur de la Haute Bassin du Mandrare (PHBM)
- Projet de développement d'élevage du Sud-Ouest
- Programmes du Plan d'Action Environnemental – World Bank
- Projet Sectoriel Elevage
- Project de développement de l'élevage dans le Sud Est (DELSO)
- Projet de Soutien au Développement Rural (PSDR) – World Bank
- Actions Intégrées en Nutrition et Alimentation (AINA) and Amélioration de la Sécurité Alimentaire et Augmentation

des Revenus Agricoles (ASARA) - European Union.

The water projects listed since 1960 are numerous; however, the problems to find water in the Deep South persist until now, as these projects and schemes have not managed to solve the water issues.

### 3.6.5 SYNTHESIS AND DISCUSSION

The availability of water has long been a challenge for the peoples of the Deep South. Water extraction is estimated at 60 percent of renewable water resources (UNDP, 2002), and water supplies could become up to 65 percent more scarce by 2025 due to the effects of climate change (Vallet-Coulomb et al., 2006).

During a period of drought and famine in the 1980s, the World Food Programme (WFP) began to provide regular support to the South. In 1980, the AES was created by the state with funding from government in an early attempt for the country to decentralise the management of water resources to regions of the Deep South, apart from some larger towns managed by the national water and electricity parastatal JIRAMA). However, the AES has had only funds for operational costs and nothing for investment. As a result, during subsequent years both ground and surface water supplies were strained by the midpoint of most dry seasons. However, the AES does benefit from support from some donors and technical partners including the African Development Bank (BAD) and other bodies linked to programmes or projects. WFP responded in the 1990s by building water storage facilities, but these facilities had insufficient capacity and were poorly managed by local water committees often established in villages by various NGOs across the Deep South. In addition, the stored water was of poor quality, containing suspended mica solids and disease pathogens (Marcus, 2007).

In 1993, the Japanese Government supported the AES with 24 trucks to deliver drinking water across the region from the Mandrare River. The trucks were valuable, but hardly met the necessities of populations across the Deep South. In addition, the system soon became corrupted as drivers requested payments for water deliveries to villages (Marcus, 2007). By 2016, the majority of the trucks were in disrepair, although many drivers continued to be employed (pers. com, Diorano-WASH). In a rural commune within the dry littoral zone of the South, the head of a village stated:

I recently saw one truck deliver water to a relatively new storage area in the Commune during the current famine. Prior to that, I had not seen any water trucks in the area. Then he pointed to an old concrete water storage facility in his village and said| this was built many years ago and has never been used.

The Government and AES have agreed that communities need to be more involved in the development and cost recovery of water supplies in their villages, but that regional, district and communal-level authorities also need to take more responsibility for effective water management. From 1998 to 2005, the World Bank's Projet Pilot d'Alimentation en Eau Potable et Assainissement en milieu Rural (PAEPAR) program attempted to work with communities on water quality and availability; however, the program was undermined by poor planning and by the self-interest of some elites. These and other failures have complicated efforts to mobilize investment in water infrastructure. Money is sometimes found, as when the Japanese International Corporation Agency (JICA) financed the construction of a 141km pipeline for AES in the 1990s, that runs from the Menarandra River to Cap Saint Marie via Tsiombe. However, the administration of this pipeline has been highly problematic due to a serious lack of accountability by AES (Marcus, 2007), although the state has showed recent interest with some restoration from 2016.

Poor administration of the water system by AES has been the cause of many problems. The Government is in the

process of restructuring AES as an agency that will oversee the private management of water supplies while working in an inclusive manner with communities. However, this will only be successful if procurement and management are transparent and the elite are not allowed to interfere (pers. com., Diorano-WASH). Furthermore, it is important that this new approach does not represent a return to centralized management (Marcus, 2007). Rather,

...the answer lies in a better understanding of the state-local nexus...the decentralization process would be more successful if the state sought to determine what it can do best (presumably with international assistance), and what the community can do best (although, decentralization should not negate the responsibilities at state, regional, district and communal levels). This is a capacity question rather than a question of power...communities need to be viewed as a complex mosaic of relationships...Only once the state accepts the diversity and power inherent in the community and engages with it, can it hope to see a completed decentralization process with net local gains (Marcus, 2007).

In addition to the management and capacity problems of the water administration, many potable water and irrigation schemes over the years never came to fruition due to the political marginalization of the peoples of the Deep South, in particular the Tandroy. Some, like Father Francois Benolo of Madagascar's Catholic University, also blame vestigial colonial sentiments, as expressed in a 1901 report to Madagascar's former French governor:

One walks in...a forest of trees without leaves...of large sinister stumps... [T]here is no water, it rains almost never... [H]e who controls the water controls the population (Lyautey, 1935).

Although the Deep South is relatively poor and has never been of great importance to the country, it does have mining resources, including mica and precious stones. However, these resources have never been used to help populations in the Deep South address water issues in their localities.

The Government is in the process of restructuring AES as an agency that oversees the private management of water supplies with local communities. However, this will only be successful if transparent processes are adhered to and the elite are not allowed to interfere in the process (pers. com., Diorano-WASH).

The principal foodstuffs eaten by people in the south include staples such as manioc tubers and leaves, maize and



## 3.7 MALNUTRITION AND FAMINE ASSOCIATED WITH CLIMATE CHANGE

### 3.7.1 HISTORY OF NUTRITION IN THE SOUTH

sweet potatoes, as well as peanuts and local beans such as antaka, voanemba and tsaramaso, which are highly nutritious and well suited to the dry littoral zones of the Deep South. Villagers also grow and consume chickpeas and, to a lesser extent, sorghum (ampemba) and millet (Parker-Pearson, 2010). Rice production is limited to the slightly humid eastern areas or is imported from other parts of the country. As it is scarce and expensive, rice, like meat, is usually only consumed on special occasions.

Food consumption in Madagascar is dominated by starch-rich products, while foods with proteins and vitamins are limited, which leads to a higher risk of malnutrition, in particular for children, as discussed in the following section and presented in Table 3b

Table 3b: Annual consumption per capita of principal food products (kg)

Principal foods	Southern regions			South	Madagascar
	Atsimo Andrefana	Androy	Anosy		
Rice	41.5	14.1	43.7	36.1	71.5
Maize	28.3	28.6	33.2	28.8	21.9
Manioc	166.3	74.6	45.1	127.4	38.2
Sweet Potatoes	9.4	26.0	21.0	15.6	8.0
Potatoes	6.5	11.9	4.6	6.2	7.3
Dried beans	6.3	2.8	23.9	11.9	6.5
Lentils/Voanjobory	4.6	2.4	5.3	4.3	3.4
Fruits	9.9	2.1	7.0	8.0	6.2
Vegetables	8.5	4.1	6.9	7.3	9.4
Red Meat	2.9	1.2	2.4	2.4	2.8
Poultry	2.4	1.2	1.9	2.1	6.2
Fish	20.6	1.3	2.1	8.6	5.0

Note: Consumption per capita is presented in descending order from highest to lowest for the Deep South

Table 3c shows that the Deep South produces significant amounts of sweet potatoes followed by manioc and maize. The Deep South consumes less manioc and sweet potatoes than it produces, but is a large regional importer of maize each year (World Bank, 2016). As previously mentioned the emphasis is on high starch products as well as an orientation to maize imported from other parts of the country. Imports will be costly, while regional production of maize in the drier parts of the Deep South is often not appropriate for the climate. During periods of drought and famine, traders from within the Deep South and outside will move to regions to sell principally manioc and sweet potatoes, when the prices will often rise and add further socio-economic burdens upon those already suffering from drought.



Table 3c: Percentage of national crop production from the Deep South in 2012

Crops	Maize	Manioc	Sweet potatoes	Rice
% of national production from the South	27.8	38.6	43.7	6.4

Source: Ministère de l'Agriculture /DSAPSE/Statistique Agricole; World Bank, 2016.

Leafy greens and other vegetables such as zucchini (courgettes) are also grown on small household garden plots for local consumption. These crops rarely reach local markets due to limited production and demand. Food is often cooked without salt, which is regarded as taboo, particularly for rice and maize. This tradition is likely to limit the population's intake of iodine, which is added to commercial sachets of Malagasy salt to compensate for lack of and need for iodine in people's diets. This salt is available from small shops in some villages across the Deep South. Local supplies of mined salt are found in the Betioky district of the South and other areas, although this supply does not contain iodine.

Records from the 18th century of crops grown in the Androy region include tobacco as well as maize, millet, sorghum and beans (Drury, 1729). Meanwhile, records from the 19th century include millet, gourds and squashes, and prickly pear cactus (Grandidier, 1868). This cactus was introduced by the French in the 18th century for the defence of its supply outpost in Fort Dauphin, and later by the 20th century adopted by Malagasy to repel the colonial French forces. Moreover cactus fruit has been an effective and sometimes lifesaving source of food and water during periods of famine and drought. Cattle can also get food and water from the cut leaves after the spines have been burned off.

Cow's milk may be available during the wet season, depending on the rains from February to March. Milking is usually done by men. Women may later convert the milk to curds and whey (habobo) using cattle urine or tamarind juice. Milk and milk products are scarce commodities, not part of the staple diet, but used mainly for hospitality, mixed with water or honey.

Meat from cattle and small livestock can be bought in the market, but is generally eaten only when an animal is sacrificed for special occasions. This is especially true for zebu meat (Parker-Pearson, 2010). Small livestock such as goats, sheep and chickens are used for hospitality or sold as a means to acquire cash.

Dry and spiny forests across the south are a significant source of food during periods of famine. The most significant wild products include honey, a variety of wild tubers and sometimes tenerecs, small native mammals about the size of a hedgehog.

Although most peoples of the Deep South live only one or two day's walk from the coast, marine resources remain under-utilized as they were during the colonial period. The French colonial administrator (Decary, 1930) observed that marine resources were often regarded as taboo, principally by the Tanosy people, although exploitation was limited in general. Even today, fishing is often confined to coastal reefs and lagoons, for mainly near shore wild fish stocks, and the collection of wild lobsters and prawns for some hotels and predominantly for export. The possibility of commercial coastal fishery development is being considered by UNDP and BGNRC. The Head of the Androy Region also wants to develop coastal infrastructure and commercial fishing fleets to exploit offshore fishing resources.

International agencies, notable UNICEF and some NGOs, have also provided some areas with modern wells and hand pumps to enable villagers to access sweet water deep under the surface. Water closer to the surface is often salty or polluted, and needs to be purified using ash, while leafy branches from Tamarind trees are used to cover buckets, although these processes do not rid the water of bacteria, including E-coli. Sweet water is also sold in

containers in public areas. Water is such a precious commodity that it is sometimes offered as a gift. Poor nutrition and unclean water can compound the risks for children and pregnant women who live far from medical facilities, which are located principally in the regional capitals of Ambovombe and Fort Dauphin. Often a female relative will serve as a midwife during the birth process. During and after breast feeding, babies are often fed a mixture of cow's milk and water to supplement their diets, which can cause diarrhea in the infants. Mothers return to carrying water and working in the fields within a few months of the birth, often with the infants on their backs. As a result of the harsh conditions for mothers, the maternal mortality rate is high, and many new-borns may not live for more than a year.

It used to be taboo to discuss the death of a child (Frère, 1958). During a focus group meeting for this study, however, women in a famine-stricken area in the littoral zone complained about aid agencies trying to save those who are dying. One woman, from an association for women engaged with various NGO activities, went so far as to exclaim with force:

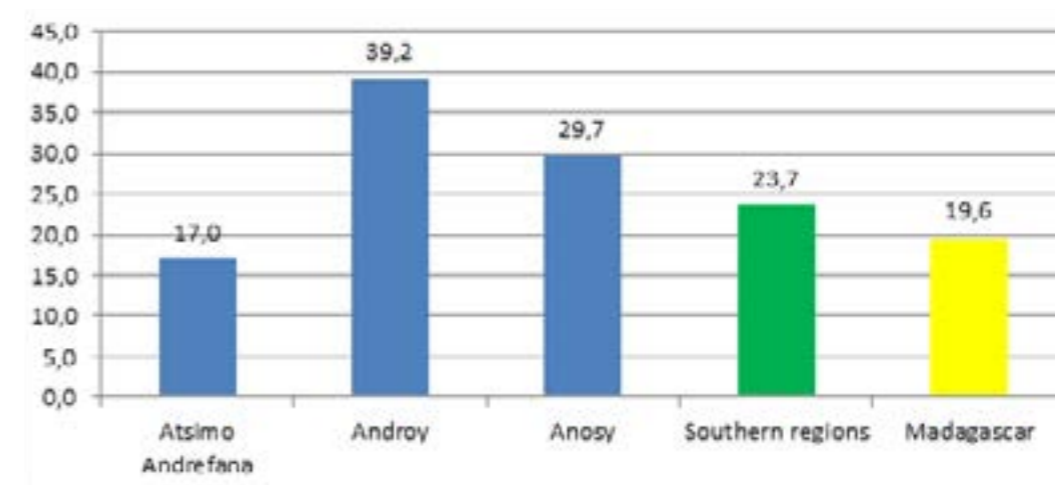
*"Why do aid agencies focus on the weakest children in our villages who will die anyway? They should focus on those who are suffering and will live!"*

Some agencies offer food and nutritional supplements for babies, such as the Plumpy Nut from UNICEF, while there is evidence that these interventions could encourage competition among desperate mothers (pers. com. UNICEF). UNICEF also stated in 2016 that some weak children were kept weak in order to maintain rations, which are shared among the household.

### 3.7.2 FOOD, MALNUTRITION AND THE POVERTY TRAP

Poor households in the Deep South spend, on average, 75 to 80 percent of their resources on food, which reinforces the poverty trap associated with day-to-day survival for most of the population. This poverty trap is reinforced by the dependence on subsistence agriculture (Figure 3v). In Androy, for example, 40 percent of subsistence production is consumed by the household, leaving little to sell for income, particularly during periods of drought (World Bank, 2016). This dependency on subsistence agriculture for both food and income is therefore a systemic factor for famine.

Figure 3v: Role of subsistence production in total household consumption (%)



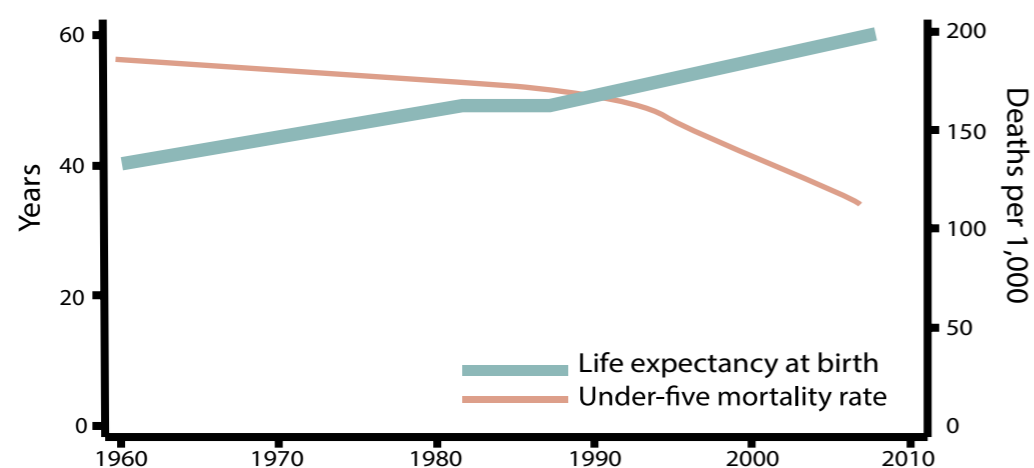
Source: ENSOMD, 2012; INSTAT; World Bank, 2016.

Note: the x-axis shows the percentage of harvest consumed by household and y-axis each of the 3 regions in the Deep South (Southern regions) and Madagascar

Madagascar has one of the highest rates of malnutrition in the world, affecting 37 percent of children under the age of five in 2004. Malagasy children are prone to malnutrition early in life. By the age of 24 months, more than half of all children are nutritionally at risk, and even more among poorer households. The level of adult malnutrition defined as a lack of calories and/or nutrients and vitamins is also high, with an estimated 65 percent of the population lacking access to the required standard of 2,300 kilocalories per day (Sharp and Kruse, 2011) being a standard used for malnutrition based upon minimum requirements proposed by the Food and Agriculture Organisation (FAO) and World Health Organisation (WHO). One consequence of malnutrition is reduced agricultural productivity, which again reinforces the cycle of poverty and food insecurity.

Figure 3w presents two non-economic correlates of poverty—life expectancy and under-five mortality—for which Madagascar have shown steady improvement over the past five decades. National figures for child mortality have fallen and life expectancy at birth has steadily increased from 1988 to 2008. Progress on these indicators is attributed to advances in health policies and facilities, as well as vaccinations and access to nutritional supplements which are required for all children. However, drought and famines will have negative impacts upon these indicators for children in the Deep South. Meanwhile climate change with its rainfall variability will present direct risks to health associated with food and livelihood insecurity and is known to also increase pressures to migrate during hunger periods (Warner et al., 2012) from the end of each dry season to the following harvest in the Deep South.

Figure 3w: Well-being indicators for 1960-2010



Source: World Development Indicators (World Bank, 2009); IFPRI, 2013.

### 3.7.3 VULNERABILITIES OF THE POPULATIONS TO CLIMATE CHANGE AND MALNUTRITION

Based upon the household survey carried out across the Deep South in 2012 (Table 3d), it is evident that some regions are far more affected than others by many types of stressors. A great number of households are affected by environment and climate impacts, followed by security concerns due to the increasing incidence of banditry and robbery based upon G4S data (Figures 3d and 3e).

Table 3d: Proportion of households affected by different stressors (%)

Type of stressors	Southern regions			South	Madagascar
	Atsimo Andrefana	Androy	Anosy		
Climate & environment	44.8	57.4	22.2	42.2	21.4
Security	10.6	6	8.8	9.1	4.9
Diseases or death	9.2	9.6	4.9	8.2	6.1
Economic problem	2.6	0.9	3.2	2.3	2.3
Others	2.4	1	2.9	2.2	2.1

Source: ENSOMD, 2012; INSTAT; World Bank, 2016.

Climate and environmental impacts, including flooding and drought (Table 3e), can lead to famine and malnutrition, when they damage crops and land. Drought is felt most severely in the Androy region, where late rains can severely reduce crop production. The southwest Atsimo Andrefana region is also often affected by locusts which occur during the wet season when crops are susceptible to attacks by swarms.

Table 3e: Principal impacts from climatic and environmental shocks associated with households (%)

Various shocks linked to climate & environment	Southern regions			South	Madagascar
	Atsimo Andrefana	Androy	Anosy		
Cyclone	0.9	0.2	1.4	0.9	7.0
Flooding	2.0	0.2	1.0	1.3	1.8
Drought	28.3	46.6	16.2	29.6	6.9
Locust swarms	8.2	1.0	0.1	4.5	1.8
Late rains	4.1	13.4	1.8	5.8	2.5
Other shocks	7.9	13.5	5.4	8.6	5.5
<b>Totals</b>	<b>44.8</b>	<b>11.9</b>	<b>22.2</b>	<b>42.2</b>	<b>43.9</b>

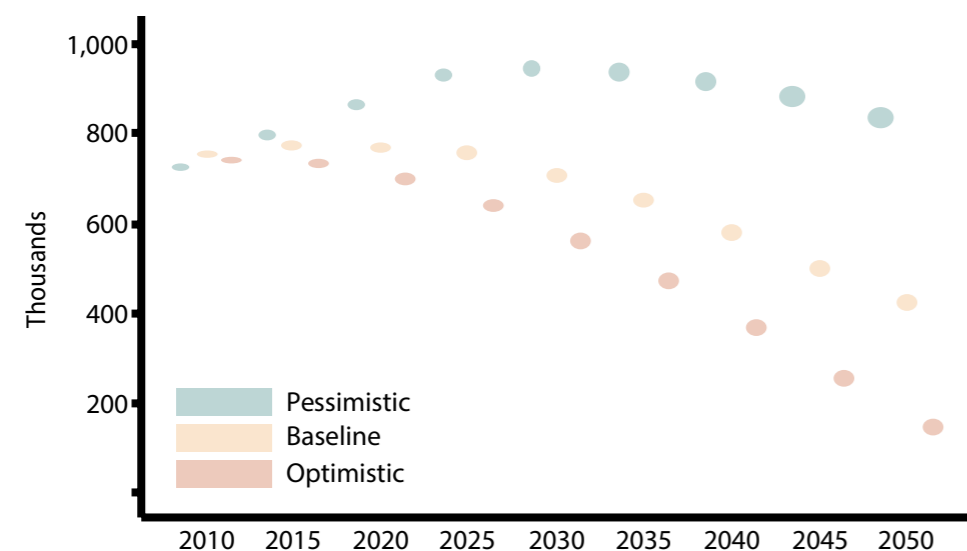
Source: ENSOMD 2012 ; INSTAT; author's own calculations.

Note: cyclones can be responsible for severe flooding although prolonged periods of rain could produce the same effect. In addition, cyclones can sometimes have more impact due to winds rather than rainfall.

The projected impact of climate change on the number of malnourished children in Madagascar is shown in Figure 3x. Figure 3y shows the kilocalories per capita available. The number of malnourished children becomes slightly worse before it gets better in both the optimistic and the baseline scenarios, but the numbers increase more steeply in the pessimistic scenario and do not drop to 2010 levels by 2050. However, as population increases in the more pessimistic scenarios it is likely the the rates of malnutrition may remain high. This scenario is also more likely in the Deep South with population growth producing high numbers of young children combined with severe impacts from climate change.



Figure 3x: Number of malnourished children under five years of age in Madagascar for multiple incomes and climate scenarios for period 2010–2050

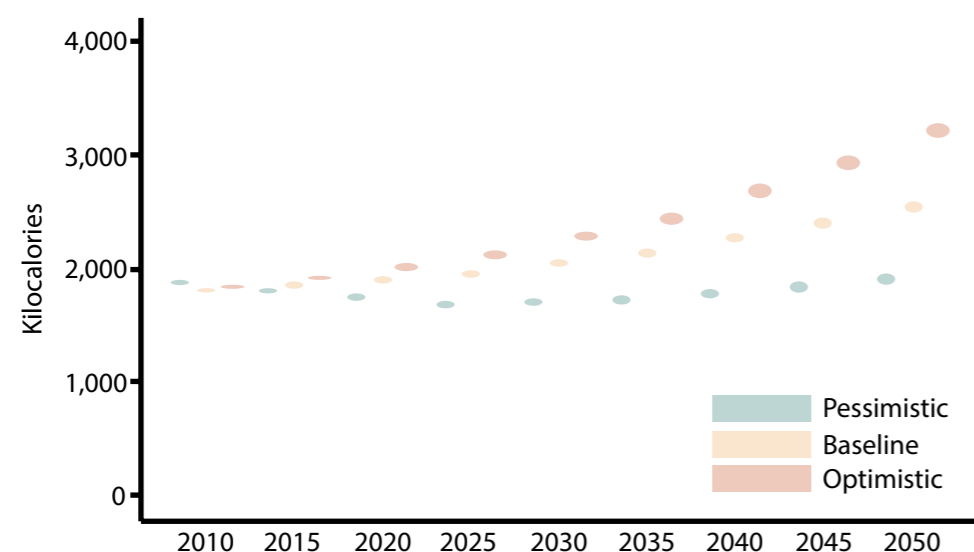


Source: Based on analysis conducted by Nelson et al., 2010; and IFPRI, 2013.

Note: The box and whiskers plot for each socioeconomic scenario shows the range of effects from three future climate scenarios

In the optimistic and baseline scenarios, the population of Madagascar will be less vulnerable by 2050. But the story is not so good for the pessimistic scenario, in which we see the kilocalories per capita barely moving back to 2010 levels by 2050 (Figure 3y). This pessimistic situation is more likely to occur in the Deep South where foreseen climate changes will reduce rainfall and increase temperatures in an already fragile and dry environment.

Figure 3y: Kilocalories per capita in Madagascar for multiple incomes and climate scenarios for period 2010–2050



Source: Based on analysis conducted for Nelson et al., 2010; and IFPRI, 2013.

Note: The box and whiskers plot for each socioeconomic scenario shows the range of effects from three future climate scenarios

### 3.7.4 FOOD PRODUCTION IN MODERN TIMES

Rice growing constitutes the primary economic activity for the majority of rural farmers across the country (Table 3f), except in the Deep South. Production is inefficient with good rice yields ranging from 1.8 to 2.6 tons per hectare making Madagascar a net importer of their preferred staple food (FINTRAC, 2008).

Table 3f: Harvest area of leading agricultural commodities in Madagascar, 2006–2008

Rank	Crop	Percentage	Harvest Area (1000s of ha's)
	All crops	100	2,885
1	Rice	43.1	1,244
2	Manioc	11.0	317
3	Maize	6.6	277
4	Sweet potatoes	4.3	125
5	Coffee	4.2	122
6	Beans	2.9	84
7	Sugarcane	2.8	82
8	Vanilla	2.3	67
9	Bananas	2.0	58
10	Groundnuts	1.9	55

Source: FAOSTAT (FAO 2010a).

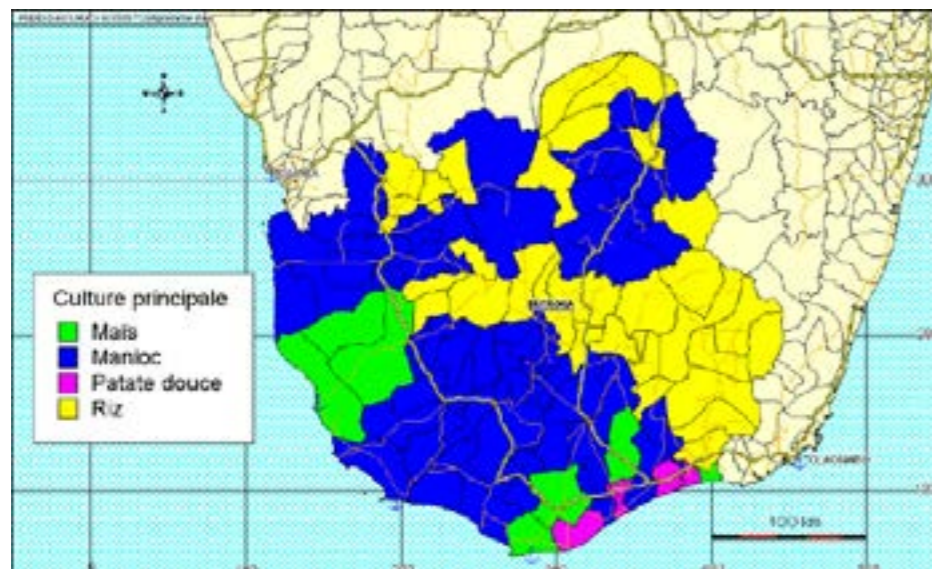
Note: All values are based on the three-year average for 2006–2008.

Manioc is the second leading source of calories, representing nearly 14 percent of food consumption, and up to 25 percent of daily calorie intake in the impoverished Deep South. In times of food shortages, families often fall back on manioc as a means of coping with hunger periods and unaffordable rice or other products (Dostie, Randriamamonjy, and Rabenasolo 1999).

The principal crops grown in different parts of the Deep South are illustrated in Figure 3z. It is clear from the map that rice production is limited to the wetter eastern and northern parts of the Deep South. This is principally irrigated rice, as rainfall is unpredictable. This rice is often grown for speculative markets in country, wealthier traders buy rice when it is abundant and cheap and when people require cash. Later, the rice is resold at a higher price when food may be in short supply.

The most common rainfed crop in the Deep South is manioc, followed by maize and sweet potato. Maize and sweet potato are preferred in the littoral zone, but like most rainfed crops, they are at risk due to the irregular climate in the region. Some small-scale irrigation projects have been initiated to improve production, while large-scale irrigation schemes remain problematic for the authorities (ANEA, 2003), principally due to the enormous costs of building pipelines and long-term management requirements.

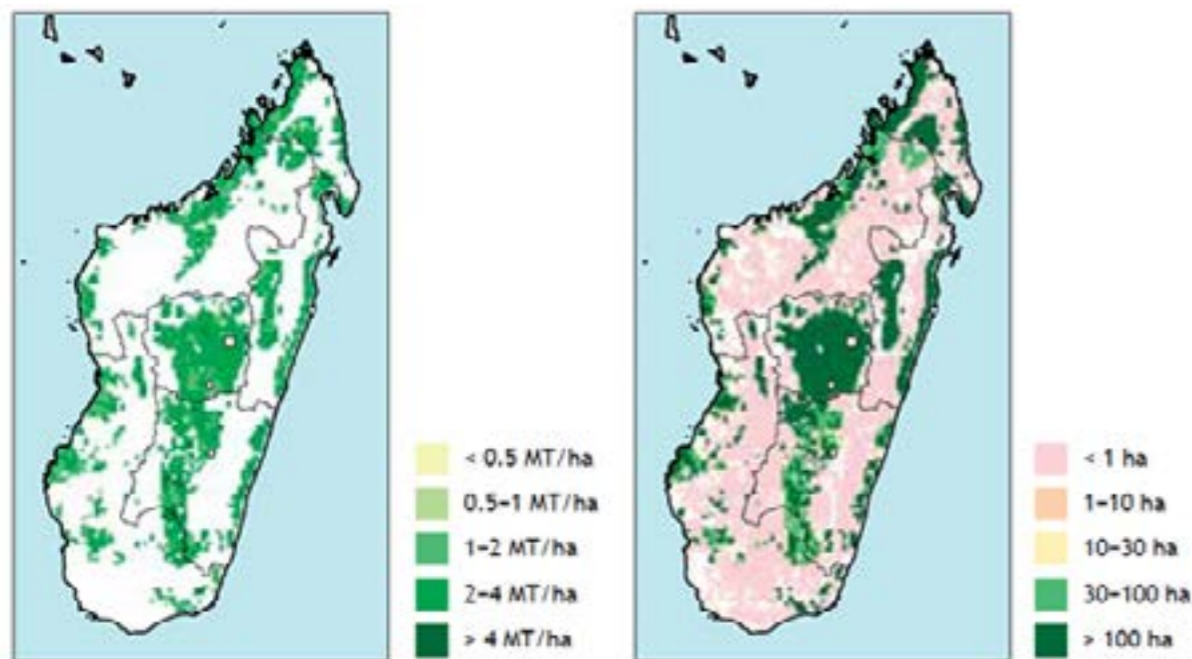
Figure 3z: Principal crops grown across the Deep South



Source: Schéma Directeur de Mise en Valeur des Ressources en Eau du Grand Sud de Madagascar, ANEA, 2003.  
Notes: green=maize, blue=manioc, pink=sweet potato, yellow=rice.

Figure 3aa shows the production of irrigated rice throughout the country. It is produced mainly in the highlands and the northwest, but in the Deep South is limited to the wetter areas of the Anosy region towards the east and some northern districts. The effects of climate change on precipitation levels will make farmers more reliant on irrigation and further shrink rainfed production in the future (pink areas in Figure 3aa).

Figure 3aa: Yield (metric tons per hectare) and harvest area density (hectares) for irrigated rice in Madagascar in 2000

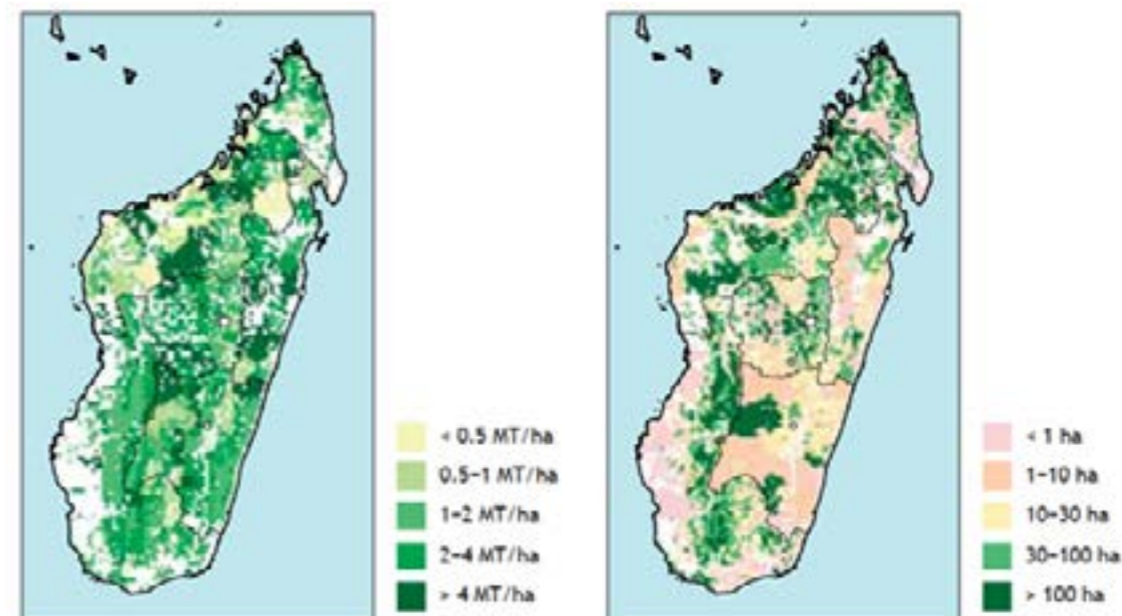


Source: SPAM (Spatial Production Allocation Model) (You and Wood, 2006; You, Wood, and Wood-Sichra 2006, 2009).  
Note: ha=hectare; MT/ha=metric tons per hectare.

Manioc grows in various types of soils, in areas not prone to flooding and with temperatures ranging from 25° to 30°C (77°F to 86°F) (Figure 3ab). Its highest level of production is in Fianarantsoa, which accounts for 35 percent of national output (Dostie, Randriamamonjy and Rabenasolo, 1999). Manioc is prone to manioc mosaic disease, which is severe during periods of high temperature and little rainfall (Ranomenjanahary, Ramelison, and Seruwagi, 2005). Climate change therefore poses a threat to this staple food crop, particularly in the south.

Commercial crops including sugarcane, groundnuts, tobacco and cotton were once well developed in areas of the southern part of the island, during the colonial period and 1st Republic, but have since declined (IFPRI, 2013). This waning of agriculture was due in part to nationalisation during the 2nd Republic from the 70s to 80s leading to poor infrastructure followed by lack of confidence in investment.

Figure 3ab: Yield (metric tons per hectare) and harvest area density (hectares) for rainfed manioc in Madagascar in 2000



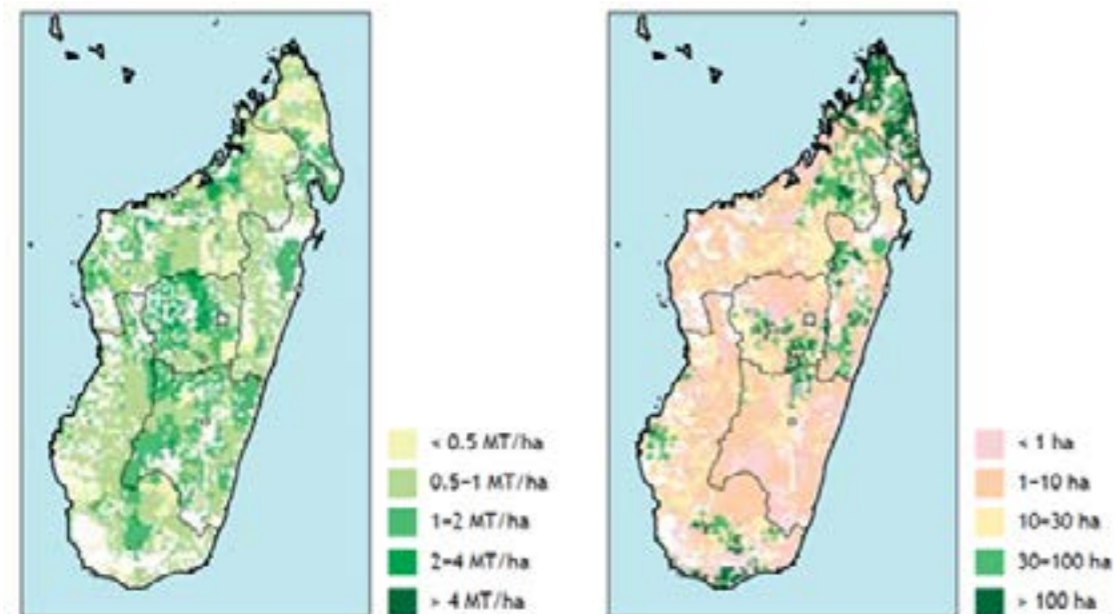
Source: SPAM (Spatial Production Allocation Model) (You and Wood 2006; You, Wood, and Wood-Sichra, 2006, 2009).  
Note: ha=hectare; MT/ha=metric tons per hectare.

Maize production may only be concentrated in several areas of the country (Figure 3ac) but it ranks third in total national production (Table 3f). Yields range from about 0.5 to 2.0 tons per hectare. Conditions are best and production is highest in the Antsiranana province in the far north of the country. The south imports maize from other parts of the country.





Figure 3ac: Yield (metric tons per hectare) and harvest area density (hectares) for rainfed maize in Madagascar, 2000



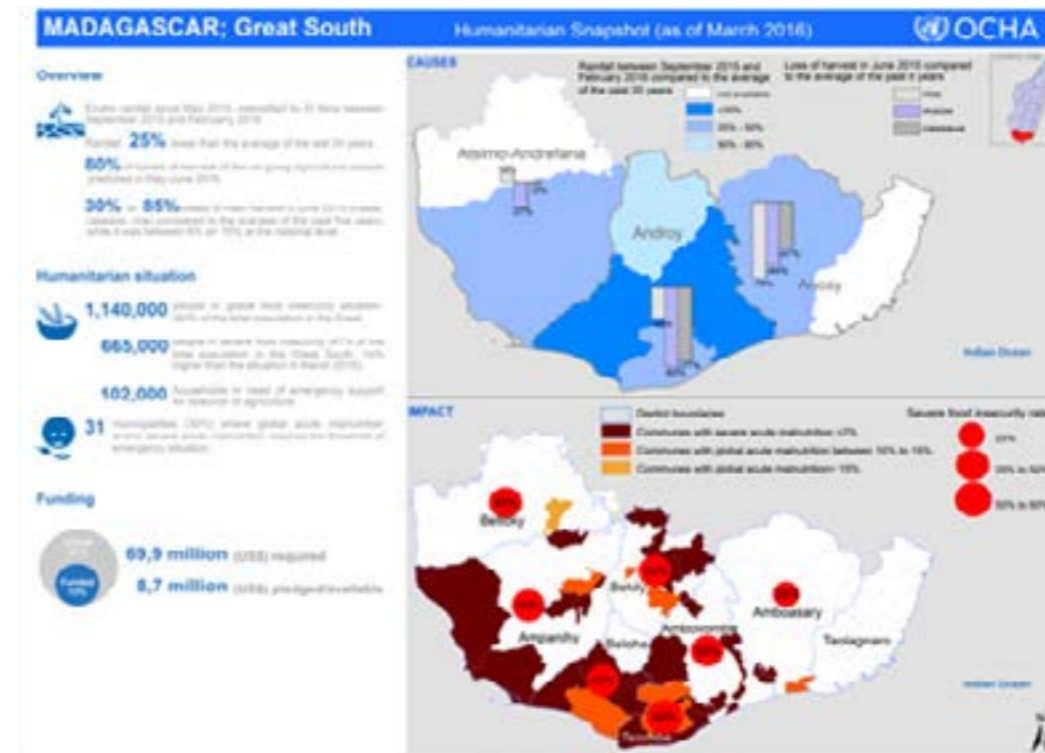
Source: SPAM (Spatial Production Allocation Model) (You and Wood 2006; You, Wood, and Wood-Sichra 2006, 2009).  
 Note: ha-hectare; MT/ha-metric tons per hectare.

The national maize yields are projected to rise by around 60 percent with suitable drier climates for the crop where it can grow, although the area available for the crop is projected to drop by around 40 percent across the country resulting in slightly increased production to 2020 and then a falling off, with 2050 production around 10 percent lower than in 2010 as temperatures increase and rainfalls diminish further. As forecast for manioc and rice (limited amounts of high quality rice are exported), the country will experience declining net exports of maize and face higher prices by 2050. Madagascar is projected to go from an exporter of maize to an importer (IFPRI, 2013). In the Deep South maize is already stressed by high temperatures and droughts in many communes, which will increase with climate change and force substitute dry climate tolerant crops, such as sorghum and millet, despite current local preferences for maize.

**3.7.5 SITUATION DURING THE FAMINE OF 2015/2016**

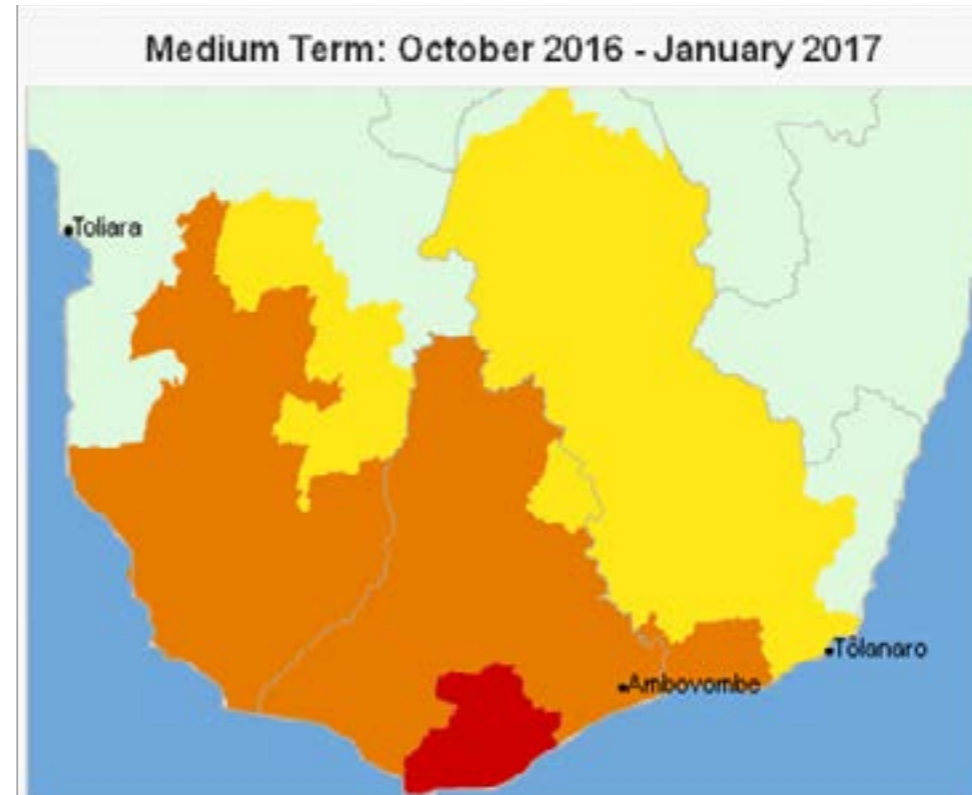
In January and February of 2016, a rapid food security assessment mission was conducted in the Deep South by the WPF, based on famine warning maps created by the UN's Office for the Coordination of Humanitarian Affairs (OCHA; Figure 3ad). The assessment indicated that 1.14 million people in the Deep South were food insecure, of which 665,000 people were severely food insecure. This represented 80 percent of the population in 7 of the 16 southern districts. Most households had exhausted their food stocks and were dedicating their remaining resources exclusively to procuring food. Food insecurity occurred from 2016 to 2017, which had been predicted by OCHA and FEWS at the beginning of 2016 to escalate across drought-affected parts of the Deep South in the form of food shortages, malnutrition and numbers of food-insecure households (Figure 3ae).

Figure 3ad: OCHA famine warning maps



Source: OCHA, 2016.

Figures 3ae: Forecast for region from Famine Early Warnings Network (FEWS)



Source: USAID-supported Famine Early Warning System (FEWS), 2016.  
 Notes: red-emergency; orange-crisis; yellow-stressed; green-minimal.

### 3.7.6 SYNTHESIS AND DISCUSSION

Climate change has significant implications for food security in the Deep South. With its underdeveloped economy, high level of poverty, and heavy reliance on rainfed agriculture, the region is highly vulnerable to the effects of increasingly lengthy and severe drought, as well as cyclones, pests and crop diseases. The manioc virus, for example, could devastate this highly important alternative to maize, which does not do well in hot, dry conditions and cannot be produced in sufficient quantities to meet domestic demand. The rapidly increasing population, expected to double by 2050, is also putting intense pressure on land and agricultural resources.

To help farmers adapt to climate change, interventions are needed to promote the use of improved seeds and fertilizers and drought-tolerant crops such as local beans; and to educate farmers about integrated pest and disease management. Some groups of farmers have also requested structured long-term support of national agricultural research and extension agencies to monitor production and develop, test, and promulgate new and alternative crop varieties, such as millet and sorghum, which can substitute for maize. Above all, there is a need for production at a commercial scale to meet the needs of all communities across the south.

To accurately forecast other extreme weather events such as cyclones, which can damage infrastructure and livestock and affect water quality and supply, the country will also need to improve its weather stations and weather information systems, and cooperate with international bodies on meteorological issues, with key indicators cross-referenced with agricultural production.

From the 1990s until 2008, Madagascar had an early warning system supported by the EU. Since financing for that system ended, there have been several attempts between the EU's ECHO project and the Ministry of Interior's National Disaster and Risk Management Agency (Bureau National de Gestion des Risques et des Catastrophes, BNGRC) to revive that system. At present, various partners have deployed their own early warning systems, but these systems may result in contradictory messages (pers. com., UNICEF). Further, some projects are integrated into SAP clusters that measure the famine risks in a group of communes with coverage focused primarily on villages near main roads, which may not capture localized famines in more distant villages.

Moreover, the indicators used by humanitarian agencies such as the WFP and the EU's ASARA program (Amélioration de la Sécurité Alimentaire et Augmentation des Revenus Agricoles) are currently oriented to health screening, which may detect malnutrition but too late for forecasting purposes. There is a need for a common and integrated early warning system using indicators such as rainfall, agricultural production, the price of water and essential food products sold in local markets, and the number of people who sell personal belongings to pay for food (pers. com., UNICEF).

It is now expected that the Government will adopt the Integrated Phase Classification (IPC) system for monitoring food insecurity and potential administered by the Southern African Development Community (SADC).

## 3.8 BUSH FIRES AND DEFORESTATION IN THE SOUTH AND THEIR IMMEDIATE TO LONG-TERM IMPACTS ON LOCAL PEOPLE

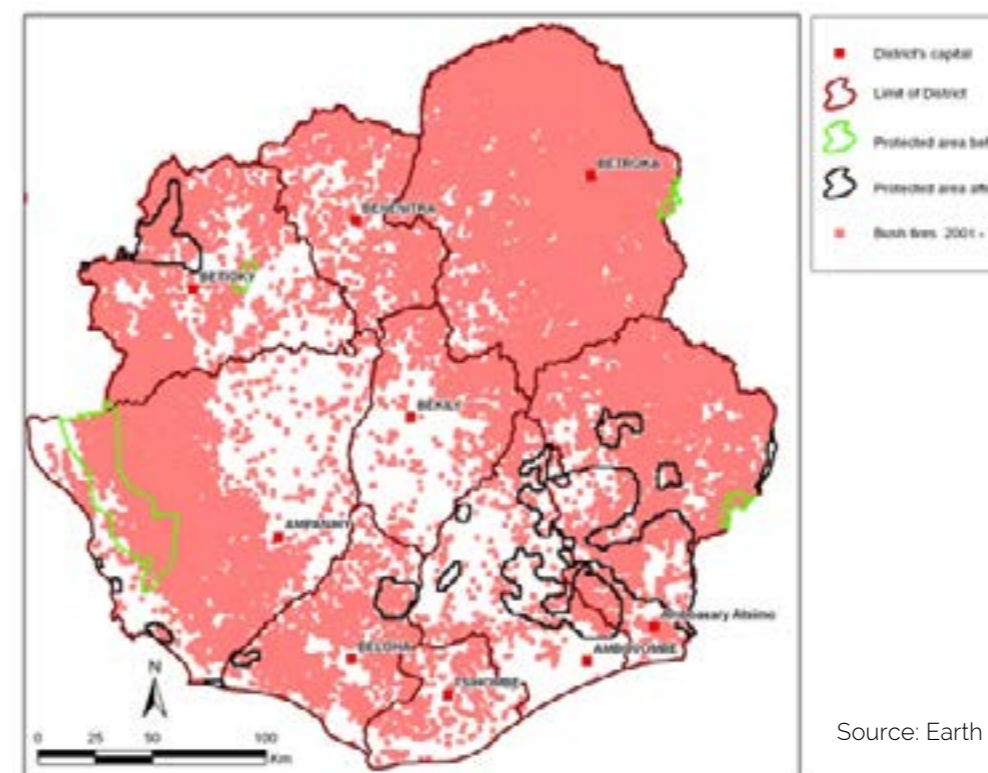
### 3.8.1 VEGETATION FIRES

Throughout the year in the Deep South there are fires burning across the semi-arid landscape. Often these fires are on farmland and pastures, which are burnt prior to the cultivation of fields, and to encourage new grasses to grow with the rains. New fields are also opened up in natural spiny and dry forest areas with the help of fires, while some fires are equally destructive when they are unattended and run wild across grasslands and through forests. These vegetation fires are observed across most districts of the south during 2001-2014 (Figure 3af). Meanwhile the number of fires varies during the period 2001-2014 (Figure 3ag).

In the Deep South there are several types of Protected Areas (PAs) being established, proposed and relatively new PAs, which serve as biodiversity conservation sites, principally for dry and spiny forests. Forest clearing for agriculture is a major threat to these PAs and their ecosystems. When vegetation fire data is overlaid with the PAs, it shows significant fires in some of these areas, either before or after demarcation.

This is a negative sign for the NGOs supporting the nature conservation of forest and their biodiversity in classified PAs. In addition, the damage to PAs may also underline weaknesses in the community engagement with PAs. The fires may be in forests, pastures, or bush savannah. Areas with a lower incidence of fire appear to be in the southern agricultural lands of Androy and parts of the savannah lands around Bekily, Betioky and Betiky. Notable fire areas in the region include the Mahafaly Plateau and insecure or "zone rouge" areas in the northern parts of the Amboasary Atsima and Betroka districts.

Figure 3af. Map showing grassland and forest/bush fires inside and outside of protected and/or proposed protected areas for 2001-2014 in each 1km2 across the Deep South

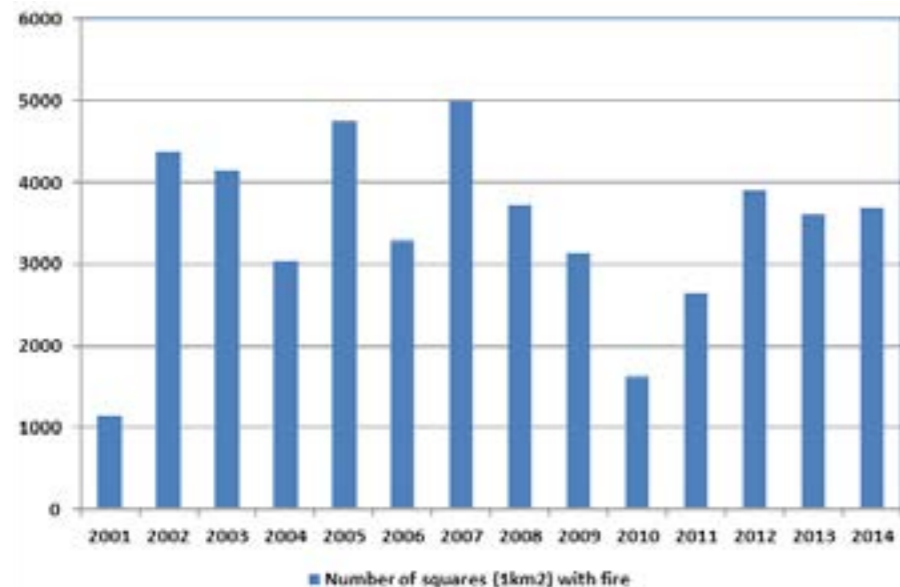


Source: Earth Data – NASA, 2001-2014.



The number of fires in the Deep South shows curious increases and rising curves near the beginning of political instability in the country during 2001-2002 onwards; and from 2010 the curve appears to almost continue to rise into 2014.

Figures 3ag: Graph showing number of fires from 2001 to 2014 in each 1km2 across the Deep South

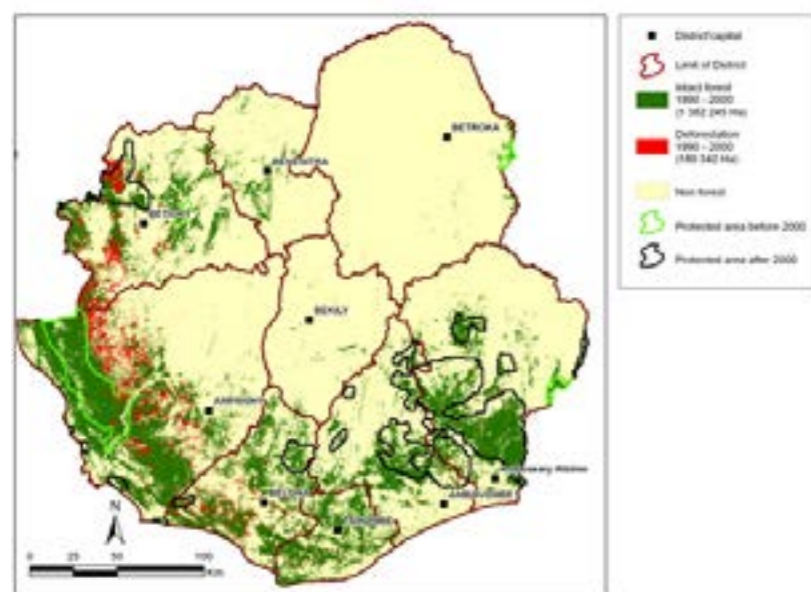


Source: Earth Data – NASA, 2001-2014

### 3.8.2 DEFORESTATION

Deforestation and the lost of forest habitats has occurred in the Deep South for a long time. However over the past few decades with rising populations, the impact of losses has become more profound across the landscape. Deforestation from 1990 to 2000 was very high, particularly on the Mahafaly Plateau (Figure 3ah). Spatial imaging of the deforestation corresponds with the rise in deforestation reported by the Ministère d'Environnement des Forêts et du Tourisme with support from Conservation International (CI) and USAID in 2009 (Ministère d'Environnement des Forêts et du Tourisme, 2009).

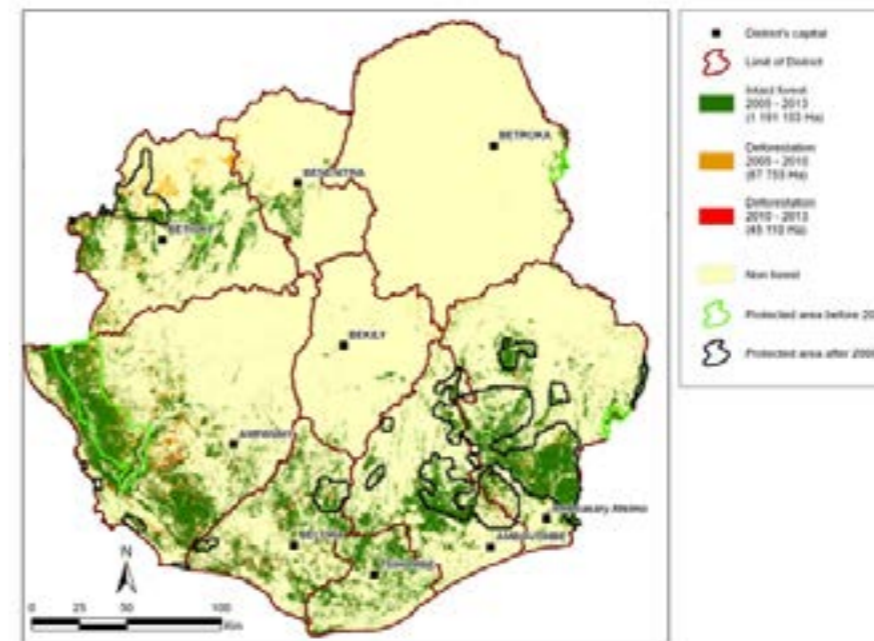
Figure 3ah: Deforestation from 1990 to 2000



Source: Madagascar Forest Cover and Clearance – CI and NASA, 1990-2000.

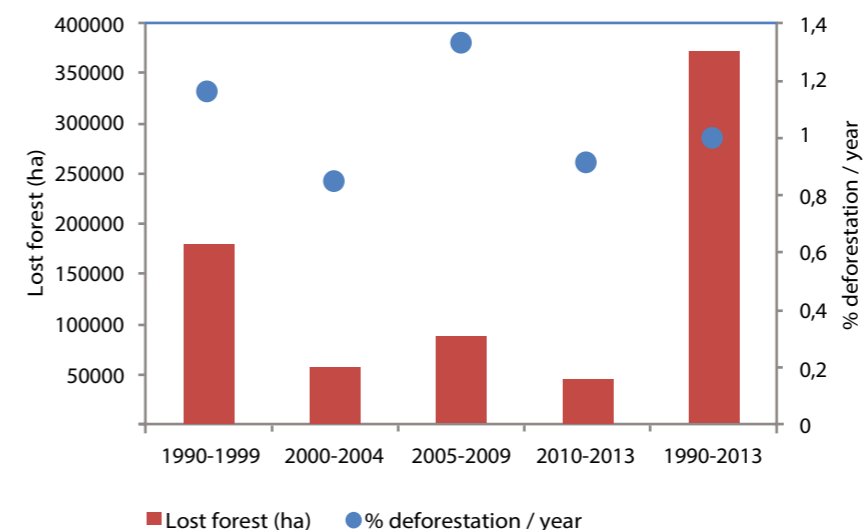
Deforestation from 2005 to 2013 was significantly lower than in 1990-2000 (Figure 3ai). and corresponds with lower losses at national level reported on a government web portal . The reason for this reduction in annual losses of forest may be aligned at this time to the movement by government with international NGOs support to crack down on burning of the land. This period coincides with the initiation of the Durban Vision to establish temporary PAs across the Deep South and elsewhere, prior to some PAs gaining permanent status, which may have reduced deforestation rates. In addition, each year there is less forested land available, which is easily accessible to farmers to burn. However, the overall rates of deforestation are still substantial, with an average loss of approximately 1 percent a year across the Deep South for the period 1990-2013 (Figure 3aj).

Figure 3ai: Deforestation from 2005 to 2013



Source: ONE Géoportail PERR-FH, 2005-2013.

Figure 3aj: Total forest loss (hectares) and deforestation (percent per year) from 1990 to 2013

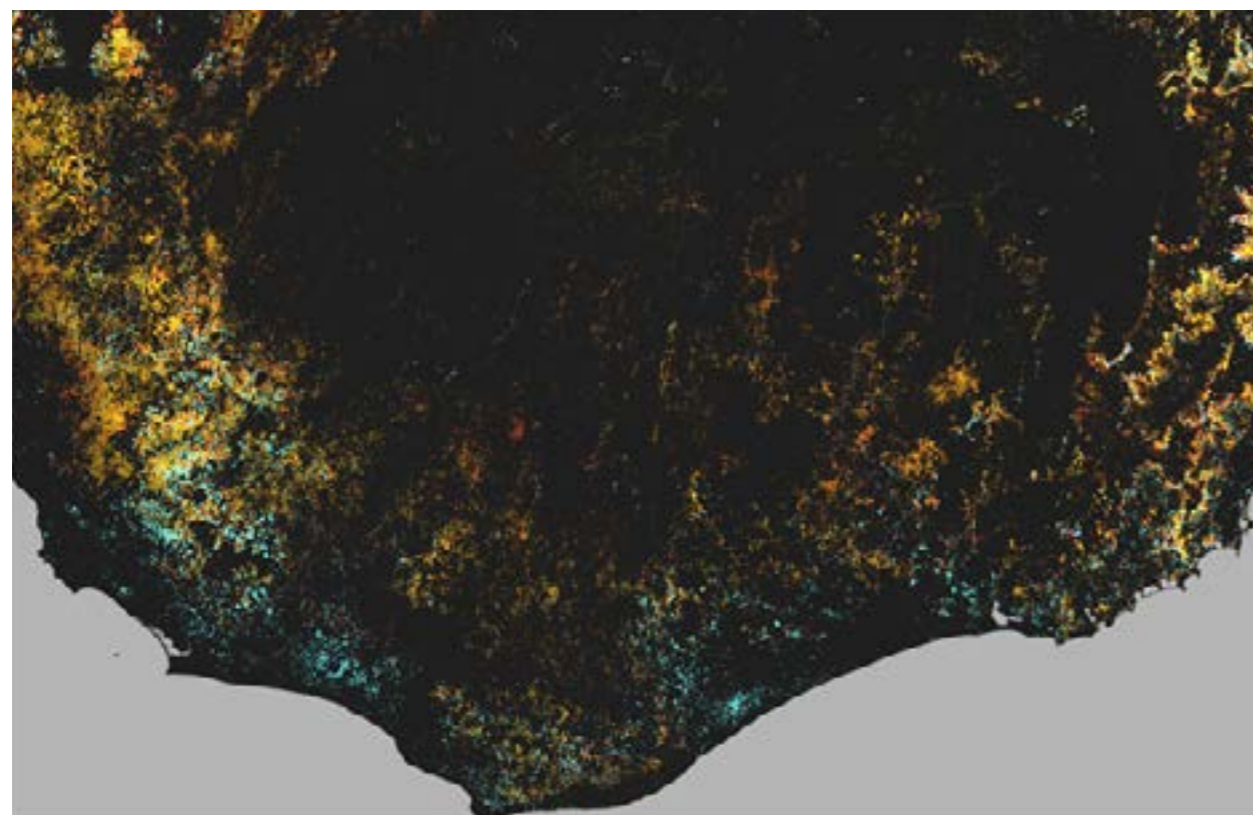


Source: Madagascar Forest Cover and Clearance – CI and NASA, 1990-2000; and ONE Géoportail PERR-FH, 2005-2013.



The most recent data for global forest losses are provided online by the University of Maryland's Global Forest Change Project. The satellite imagery for the Deep South (Figure 3ak) shows significant forest losses in light blue. Deforestation appears to be mainly in areas outside PAs in the west and central parts of the Deep South, but there also appear to be significant and localized losses in parts of comparatively new PAs to the north of Ambovombe and Amboasary Atsimo.

Figure 3ak: Forest loss (light blue areas) in the Deep South from satellite imagery, 2014



Source: University of Maryland, USA, Global Forest Change Project, 2014.

### 3.8.3 SYNTHESIS AND DISCUSSION

Vast forested areas have been destroyed through the traditional practice by farmers of burning savannah and bush savannah prior to the wet season to encourage new plant growth for their herds and space for the planting of crops. Losses in established PAs during the period 1990-2000, and revived burning since 2014 inside some PAs in the eastern part of the Deep South, show increasing pressure on all forested areas both inside and outside of PAs.

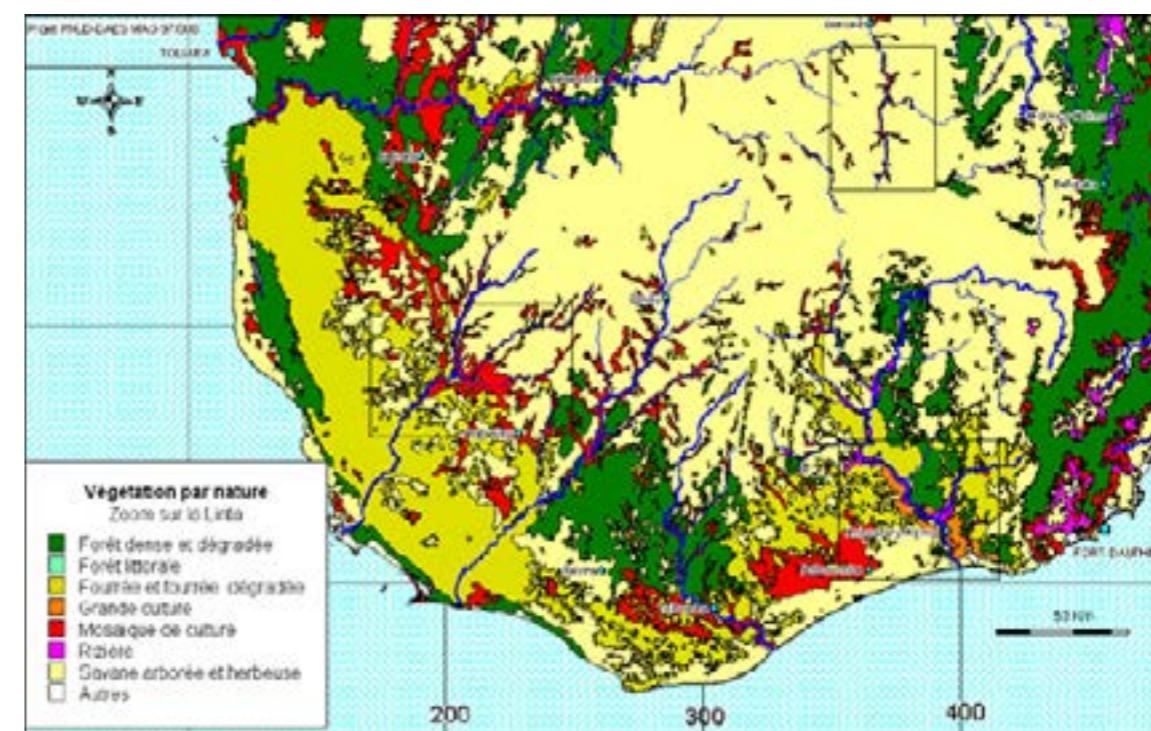
The deforestation trend will continue as populations grow, in the absence of alternative incomes or more efficient means of production. Reversing this trend will require strategic, long-term development initiatives aimed at expanding the economic choices of the population.

## 3.9 LEGACIES OF COLONIAL LAND GRABS, DELIMITATION OF PROTECTED AREAS AND AVAILABILITY OF FERTILE AND IRRIGABLE LANDS

### 3.9.1 DESCRIPTIONS OF LAND COVER AND LAND USES IN THE DEEP SOUTH

Land cover in the Deep South is composed of dry vegetation with dry forest and thorn bushes, and open and closed savannah grasslands (Figure 3al). The decline in forest cover, estimated at 200,000 ha per year across the country, is mostly due to conversion to agricultural land through slash-and-burn cultivation practices. Slowing forest loss is important in order to sustain biodiversity as a potential source of germplasm to assist responses to climate change in the future. This is of particular importance in the south, where existing dry and spiny forest would have difficulty regenerating under further adverse climatic conditions.

Figures 3al: Land cover and land uses across the south



Source: Schéma Directeur de Mise en Valeur des Ressources en Eau du Grand Sud de Madagascar, 2003.

Notes: dark green-dense forest, blue-coastal forest, light green-bush and degraded bush, orange-intensive agriculture (sisal), red-mix of croplands, pink-rice fields, yellow-grassland and bush savannah, white-others.

### 3.9.2 LAND OCCUPATIONS AND DELIMITATIONS SINCE THE EARLY 20TH CENTURY UNTIL RECENT TIMES

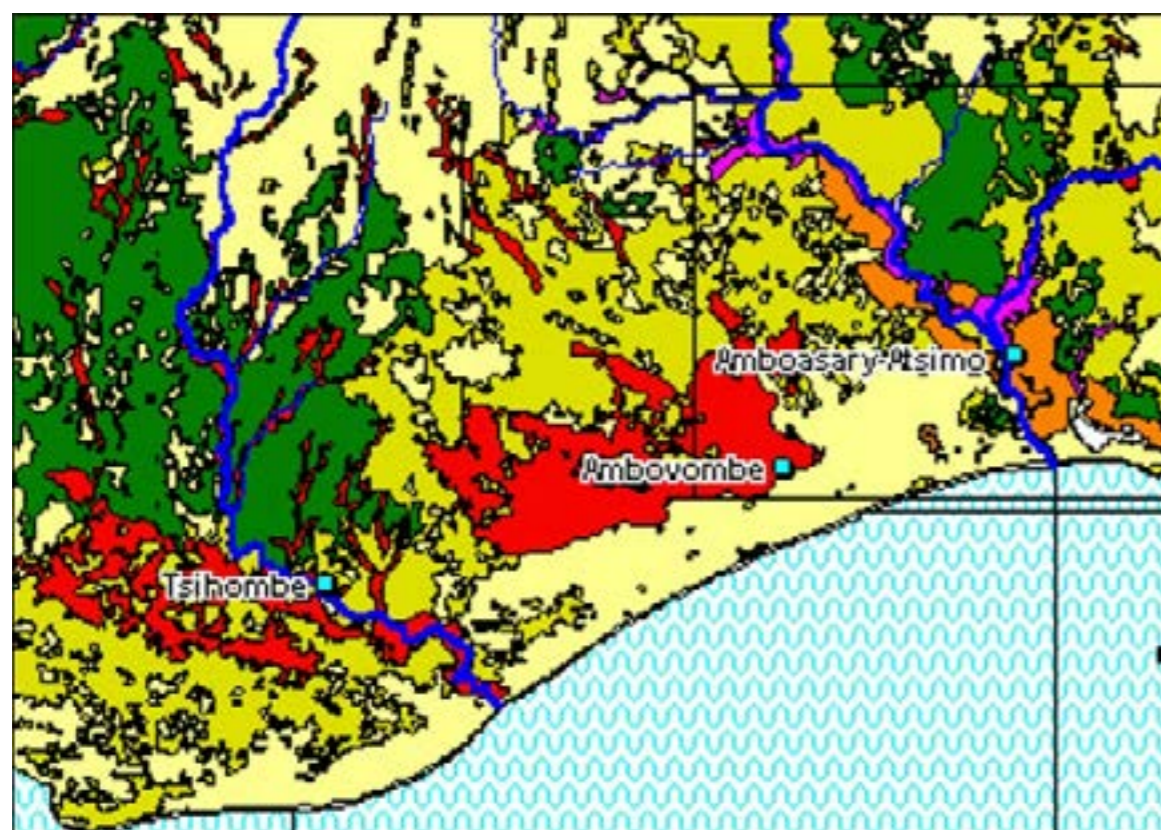
The principal land occupations of the past, known by the locals as "land grabs," began in the 1930s, when French colonial companies prospected for land to develop industrial-scale farming in the Mandrare Basin near Amboasary Atsimo (orange area in Figure 3am). Most of this land had relatively good alluvial soils near the permanently flowing Mandrare River, an important source of water for irrigation. Prior to this period, the area was regarded as off-limits to colonials, as local people in the Androy region and other remote areas were hostile to outsiders. Generally people



had not been entirely appeased in comparison with parts of the south-eastern Anosy region and in particular the town of Fort Dauphin. In these areas people had had regular contact with strangers, notably from the French period of Flacourt, the Portuguese's establishments, the Merina governor from the highlands, and finally being the principal town in the Deep South for the French colonial forces and administration

The colonial companies developed food and livestock farming and sisal plantations. However, food and livestock activities had negligible returns, and livestock was often subject to cattle rustling associated with manhood customs by young men and bandits or malaso in the Deep South, which discouraged investment (Ferguson, 2010).

Figure 3am: Mix of traditional croplands (in red) and intensive sisal production (in orange) between Tsihombe and Amboasary Atsimo

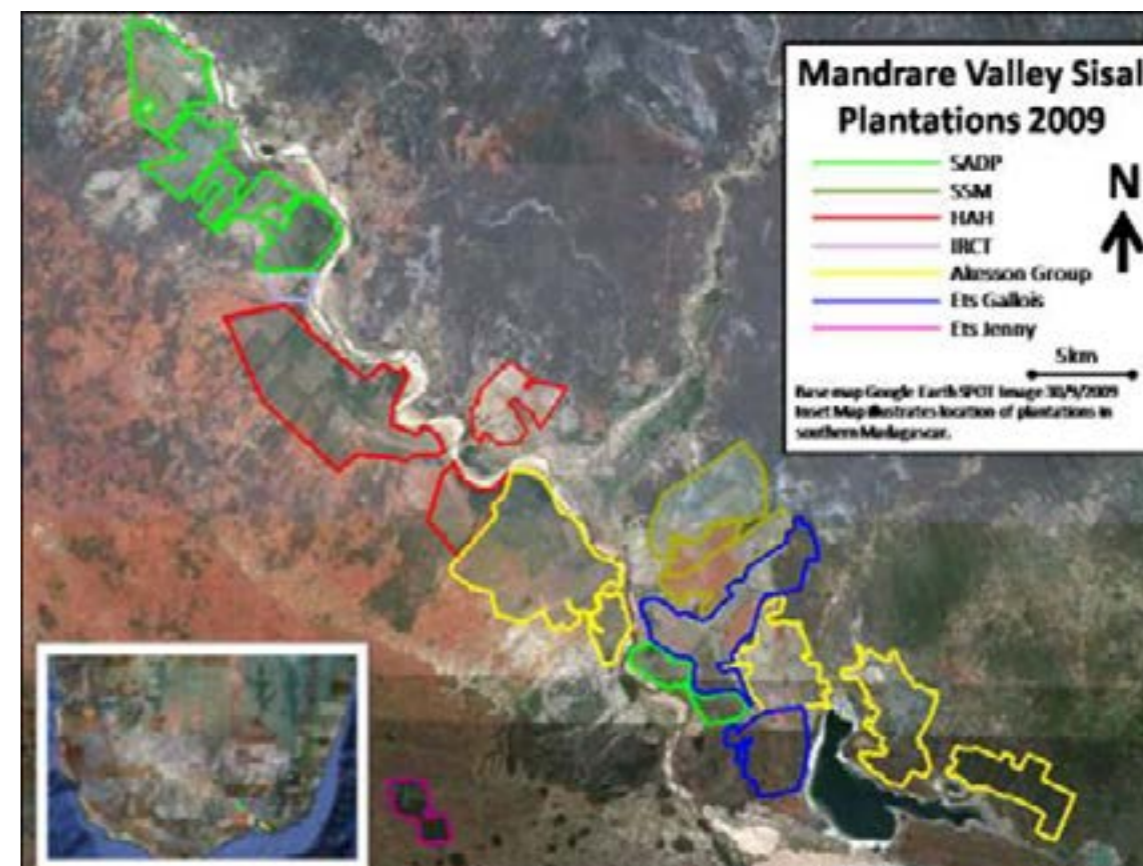


Source: Schéma Directeur de Mise en Valeur des Ressources en Eau du Grand Sud de Madagascar, 2003.  
 Notes: dark green=dense forest, lime green=bush & degraded bush, orange=intensive sisal production, red=mix of croplands, pink-rice fields, yellow=grassland and bush savannah.

Sisal cultivation between the 1930s and the 1980s expanded with five companies (Figure 3an) to cover 65,000 ha. Meanwhile filed land claims by sisal companies have been significant in more recent years (Ferguson, 2010).



Figure 3an: Sisal plantation companies and sites in the Mandrare Basin



Source: Ferguson, 2010.

Land conflicts have continued in most villages and some communes around the sisal plantations since their establishment until the present. Relatively recent clearing of forested areas for additional sisal fields has been particularly unpopular with locals who had used these lands for forest pasture and wood products. This pressure on lands for sisal in this area may have compounded land issues with NGOs attempting to save the biodiversity within PAs near these areas (Ferguson, 2010). It is important to note that the sisal companies have overcome local opposition as they hold significant economic power with the administrations in the region. However, if the lands were left to the local communities and not under the ownership of sisal farmers, there is a significant chance that they would also be cleared by villagers for farming based upon current deforestation scenarios in the Deep South.

### 3.9.3 DELIMITATION OF PROTECTED AREAS

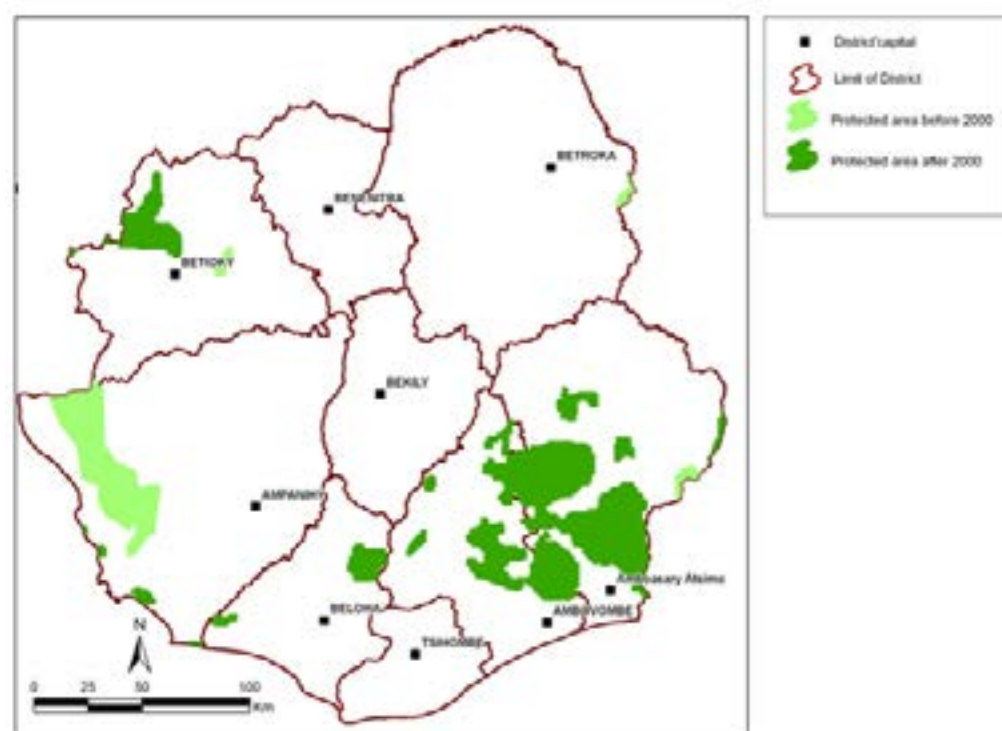
Madagascar has several types of PA which were established before 2000 or designated with full or temporary status after 2000 (Figure 3ao), and categorized according to the guidelines of the International Union for Conservation of Nature (IUCN). In recent years, new Category VI PAs have been established in parts of the Deep South which allow for partial use of PAs through sustainable use of natural resources by local people. These areas are managed by local community associations or VOI under the auspices of NGOs, principally the World-wide Fund for Nature (WWF) with support from GIZ (German Cooperation), and Missouri Botanical Gardens (MBG) in the Deep South. There are also new extensions and development project zones around existing PAs, such as Tsimanampetsotsa PA managed by Madagascar National Parks (MNP) and included in WWF's Mahafaly Plateau landscape programme area. These extensions have brought considerable portions of marine and coastal environments into the PA system; in accordance with the Durban Vision's declaration of 2003 to triple the surface of protected areas from 1.7 million



to 6 million ha (Figure 3a0). Following this declaration, a national policy was adopted in 2006 to increase the number of sites and land coverage under PA management. PA site selection was based primarily on biodiversity priorities for nature conservation, the level of threats upon different ecosystems, and sites where nature conservation may have the greatest chance to succeed.

New programs using carbon credits have been assessed as a potential means to fund the management of these new areas, which can be expensive. This mechanism may not be useful for spiny forests, which do not store much carbon in comparison with higher-carbon humid forests. Some carbon projects examples in southern Madagascar include the World Bank Forest Carbon Partnership-assisted schemes associated with REDD+ focusing on humid forest habitats of the eastern domain near Tolanaro (Fort Dauphin), which is outside the semi-arid Deep South and east of Amboasary Atsimo.

Figure 3a0: Protected areas (PAs) before 2000 and some proposed and/or PAs (terrestrial) after 2000 in the Deep South



Source: Adapted from Waeber et al., 2016.

### 3.9.4 DSYNTHESIS AND DISCUSSION

The mass deforestation by colonial plantation owners, and the continuation of traditional slash and burn practices by locals searching for fertile soils and pastures have caused the rapid loss of forests across the south. The loss of this vital natural resource is of concern for biodiversity conservation, for livelihood resources for local peoples, and for climate change impacts. Recent observations indicate that there are new regional migrations from the Mahafaly Plateau to the coast with herds of cattle which cross traditional demarcations of pasture lands (pers. com. WWF's Sustainable Land Management (SLM) project) These migrations have the potential to provoke land conflicts as more people and animals move into coastal areas.

Efforts to protect forests date back to the beginning of the massive land conversions for sisal plantations in the 1930s. While these efforts have been important, they have also restricted the area available for agriculture and livestock and

have contributed to food insecurity in the region. In the Deep South humanitarian agencies have approached nature conservation NGOs to encourage them to use "food for work" programmes to replant forest in famine-affected areas associated with PAs or potential PAs. However, there has been limited analysis or coordination between the two types of programs, which has been problematic for the design of longer-term community engagement strategies (pers. com., WWF's Sustainable Land Management (SLM) project). In addition, replantings has not always been successful, due either to an unfavorable climate for the new trees or to a lack of funding to manage the areas.

Members of some community forest management associations or VOI in focus groups have expressed the desire to manage their forests independently of NGOs. This is a sensitive issue due to the potential for mismanagement associated with poor governance by local leaders. However, empowerment of VOIs could help them to develop good governance practices, which would ultimately enable them to attract direct funding from foreign or national funding agencies. This approach would certainly be more attractive for local people than are the occasional revenues they receive from tree replanting associated with forest protection schemes. Direct funding would also allow local people to determine how best to invest their money for the protection of forests and the development of forest-based livelihoods.





## 3. 10 TAXATION AND INTEGRATION OF COMMUNITIES INTO A FORMAL OR SEMI-FORMAL ECONOMY FROM PRE-COLONIAL TIMES TO THE PRESENT

### 3.10.1 TRADITIONAL ECONOMIES AND WEALTH IN THE SOUTH

From colonial times to the present, famines have triggered a continuous movement of peoples from the south, notably the Tandroy, to other parts of the country in search of food and revenue. This was also a major shift in trading from the 18th and 19th centuries, when the locals began to exchange cattle for guns, fabrics and metals. Trading at this time also included one of the earliest cash crops, the wild Roccella lichen, which Europeans used as a purple dye for wool and cotton.

For a period in the 19th century, there is evidence that foreign and indigenous communities lived in close proximity to each other in parts of the remote south (Parker-Pearson, 2010). The situation soon changed when Tandroy warriors headed east on a raiding expedition in 1895, just prior to colonization in other parts of Madagascar, when foreigners fled to Fort Dauphin. In 1901, the French colonial forces sent troops, including Senegalese fighters, to control the population; and in 1904, retrieved the 12,000 muskets that had earlier been provided to locals by French traders (Deschamps, 1960).

French colonial administrators also attempted to suppress the construction of large tombs, a repository of much of the wealth of the south, in an attempt to formalize the wealth into taxable economic activities. In the past wealth would have been in cattle and goods collected from forests such as plants and animals, which were bartered for other goods or services between local and foreign traders. With colonial systems the concept of money became more omnipresent, particularly in larger settlements. Gradually over time money has evolved within the rural economy across the Deep South, as a means to principally buy clothes, medicines and food supplies at local markets. Formal employment includes limited numbers of jobs with the civil service and some NGOs, while the private sector is virtually non-existent apart from small street traders.

In the early 1990s, mining also became a significant economic activity in the Deep South, when sapphire stones were discovered in the northern Anosy region, prompting many young men to move to sites where the stones had been discovered, including Diego in the far north and Ilakaka in the southwest. There are now many artisanal mining sites around the country (Cook and Healy, 2012), which are exploited by miners, including many from the Deep South known for migrating, and who may have been successful in the past and effectively became professional artisan miners over time. Mining has helped some of these people and their families who are lucky enough to find some stones of value, although life can be hard and sometime dangerous in mines. Meanwhile, the communities near these mines have often not gained significantly as the money is rarely taxed and there is little to no investment into community facilities from the wealth. However, mining is an alternative for some, when they have nothing else and need to make a living.

While the social status of women, particularly Tandroy women, is generally low in the Deep South, recent times have seen women developing small businesses trading in mats, cloth and various commodities, and some have also become wealthy traders and owners of cattle. However, husbands will sometimes try to block this wealth creation or encourage their wives to entrust the cattle to them (Fee, 1997). Wealthy families are likely to have more

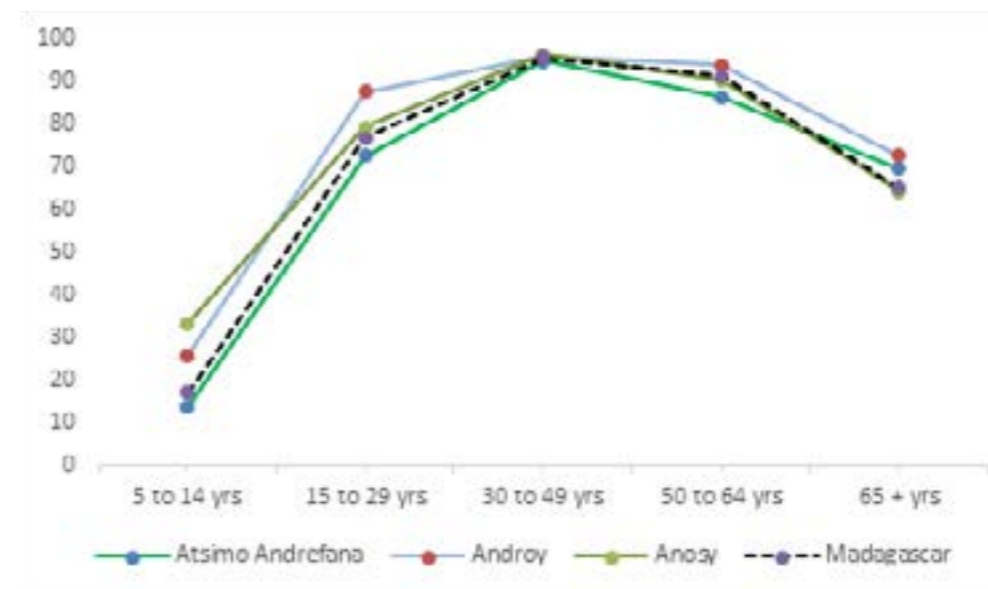
money providing better living standards in general including household needs and means to support the schooling of their children, although tombs and herds of zebu cattle will remain culturally and symbolically important. The less wealthy may be able to engage in small-scale livestock production as a means to access cash for specific needs such as essential items including cooking utensils, food and medicines.

Despite the development of a cash economy, the Deep South remains one of the poorest regions in one of the poorest countries in the world. This poverty is apparent in the low quality of consumer goods such as cheap imported tin pots, although these goods are sometimes even placed on top of tombs as a sign of wealth.

### 3.10.2 ACTIVITIES AND BUSINESSES IN THE 21<sup>ST</sup> CENTURY

The proportion of people in the Deep South who are actively engaged in both formal and informal work, including agriculture and trading, is similar to national figures, about 60 percent of the population, although figures are higher in rural areas, where activity is virtually compulsory for survival (Figure 3ap). The Deep South also has more children (5 to 14 years) working for their families on the land, compared to the average for Madagascar. About two-thirds of the active people in the Deep South, including children, have no or little education, which is about double the national workforce average of 30 percent. Unemployment rates are difficult to ascertain and analyse in an informal economy where subsistence agriculture occupies 84 percent of the national rural population, and 88 percent in the Deep South. Rural households also engage in some secondary non-agricultural activities, including forest products and small-scale livestock, construction work, manufacturing and handicrafts.

Figure 3ap: Activity in various age groups



Source: ENSOMD, 2012; INSTAT; World Bank, 2016.

The second most important activity is commerce, which is higher in the urban Deep South, at 28 percent, compared to the Madagascar urban average of 18 percent. This indicates that trading is re-emerging as an important source of revenue for livelihoods across the Deep South, although the economy remains limited and poor. About 2 percent of children in the Deep South may also be involved in some forms of commerce (World Bank, 2016).

Revenues generated from non-agricultural activities are significantly higher in urban areas across the country compared to rural areas. In addition these revenues provide a proportionally higher contribution to total revenue in the Deep South than in the rest of Madagascar at 59 and 45 percent, respectively (World Bank, 2016). This difference shows the potential of non-agricultural activities to contribute to growth in the region, if there are economic opportunities. Currently, the region remains much poorer than most parts of Madagascar, where the actual amount of tax collected is significantly lower (World Bank, 2016). This scenario may also restrict infrastructure investments creating a vicious circle whereby the Deep South remains poor.

The credit situation in the south is comparable to most parts of Madagascar. Non-agricultural and agricultural enterprises are principally self-financed through household income, as bank credit is not available and microcredit services supported by various donors' charge high interest rates of almost 50 percent a year (World Bank, 2016).

### 3.10.3 SYNTHESIS AND DISCUSSION

The first settlers were of Swahili origin that arrived in the Deep South from East Africa about 1000 years Before Present (BP) and traded with other Swahili merchants until the 13th century, which ceased during periods of warfare in the region. Trading re-emerged in the 18th and 19th centuries when local people started to trade cattle for guns, and local dyes for textiles, with European merchants.

Dynasties had arisen across the Deep South since the 16th century, but faded through division among various leaders and reticence from their peoples until the disappearance of kingdoms by the late 19th century. With the fall of the dynasties in the region, clans and families gained importance. The semi-nomadic Tandroy and Mahafaly also developed cultural and spiritual attachments to their cattle that effectively ended their trade in animals. The French attempted to push the herders into sedentary farming structures that could be integrated into the monetary economy, although many locals resisted and continued to travel with their herds across the Deep South.

Money and material possessions are now part of the culture in the Deep South; however, the concept of paying taxes is not, as many people are still very poor and live a life of subsistence with minor informal trading. The more lucrative activities such as cattle rustling and mining are often illegal and virtually impossible to tax. Nevertheless, the average amount of tax paid by the taxpayers to central government from the Deep South is higher than the rest of Madagascar, which is a sign of the region's potential, provided that the government and donors do more to support the region's development.

The World Bank has initiated a development pole project (PIC II) in the eastern part of the south that supports the decentralization of revenues through several pilot projects to assist rural communes in the Anosy region. However, this and similar development programs may not be as effective as envisioned if they do not address some basic long-term issues such as the need for low interest microcredit to support local businesses, which could potentially increase revenues and opportunities for some communes.

Women in particular are looking for low to zero interest loans to develop small businesses, which they believe will help to free them from dependence on outside programs. One women's association in a famine zone proposed an alternative to an existing EU microcredit scheme that would charge a lower interest rate and pay that interest into the association's own fund to finance other loans. Technical support for commercial agricultural activities is also available from the Regional Agricultural Development Fund (FRDA), associated with rural development

programs and projects in the Deep South receiving funding from principally the World Bank and Agence Française de Développement (AFD), as well as various other partners across the country. This support is directed through the Agricultural Service Centers know as CSA, which locate associations requiring support, for example, a cart, agricultural tools, or technical support. This system is coordinated by senior members of the association, who take full advantage of its benefits but may not necessarily represent the interests of communities. Some stakeholders have suggested that the CSA should become a permanent agricultural extension service, which would provide long-term and appropriate sources of support for farmers in the Deep South and elsewhere. A permanent extension service may be a more strategic and sustainable approach to agricultural development in food insecure areas than the various approaches being implemented by different donors at present.

One donor, UNDP, is supporting efforts by the disaster and risk management agency, BNGRC, to develop a comprehensive resilience and recovery plan for the Deep South. The process involves workshops and consultations aimed at eliciting the views of locals about what kinds of help they need during droughts and famines. Care must be taken, however, to ensure that the process is not captured by village elites and local authorities.

The response to famine in the past has typically been through food aid programs and appeals to the private sector for charitable donations in the Deep South. With appropriate support, the private sector could also play a role in expanding employment and business opportunities in the Deep South. At the same time, care must be taken to distinguish between short-term humanitarian assistance for famine relief and longer-term development programs focused on economic development, employment, improved nutrition and sustainable agriculture. In the past, the mingling of famine relief and development programs has sometimes resulted in the sale of food supplies and nutritional supplements from famine-affected areas.





# 04

## CONCLUSIONS

The remoteness of the south has helped to conserve important elements of the cultures, identities, and social and political power structures of the various peoples who inhabit the area, particularly those living in the harshest and most isolated environments. These factors have made it possible for them to resist Western values and the influence of the state. However, their isolation has become a danger to their survival due to the increasing incidence of drought, famine and other climate disasters. This is equally true for those who maintain a semi-nomadic existence and those engaged in sedentary agriculture.

Development efforts have not always been compatible with the cultural needs of the people in the Deep South to maintain their spiritual attachment to cattle and construct large family tombs. Moreover, the vestiges of semi-nomadism and transhumance are likely to be more difficult in the future with denser populations and competition for lands. However, if pastoralists were offered opportunities to manage their ancestral lands and pastures, and had access to corridors for transhumance across land owned by farmers, then the semi-nomadic way of life would have a chance to survive.

A United Nations study from 2011, *Le Sud Cimétière de projets?*, noted that "some have said that peoples from the region [Deep South] have particular values which are in contradiction to efforts to develop the region." But in reality, peoples of the region have an interest in trade, and opportunities in these activities could be expanded while respecting cultural norms. Women in focus groups have spoken of their ambitions to own a business through associations attached to NGO projects. As some women have been known to be better cattle traders and money managers than their husbands, development agencies could support their efforts. However, male dominance in homes may undermine women's ability to benefit from their enterprises. Development interventions also need to take account of the importance of pacts and agreements between various groups to avoid conflicts over food, water and grazing land during droughts and famine. Only by taking account of these factors will efforts have a positive impact over the longer term.

The sea and marine resources, long overlooked as a source of livelihoods, offer opportunities for isolated communities near the coast, as well as for the entire Malagasy economy. Exploiting these resources will require the establishment and maintenance of national infrastructure, principally roads, and investment in offshore fishing vessels. It will also require the development of a short and longer-term strategy to support business development by both genders, including business advisors and accessible financing; and to identify commercial outlets for fishery products.

From quasi-independence in the early 19th century, when the Tandroy people defeated attempts by the Merina armies to pacify and unify the country, to the resistance to French colonialism, the peoples of the Deep South have had the reputation of being defiant. However, much of the lassitude regarding improvements and development in the region can be directed to some of the elite and intellectuals of the region, who have done little to help their people while benefitting from their own contacts through consecutive government regimes and the outside world. Moreover, Government appeasement of the malaso as a way to fight crime, including giving them impunity for their cattle theft and allowing them priority access to humanitarian aid, may have exacerbated instability in the region and perpetuated injustice for their victims.



Small-scale cattle theft had traditionally been a cultural rite of passage for young men, but it became an organized enterprise with the establishment of partially foreign-owned abattoirs over the last few years in the region that bought meat for export. This led to armed retribution by communities against the malaso, which escalated into dangerous instability. The international community, including UNDP, have used aid programs to support the reconciliation process; and some humanitarian agencies also depend on malaso who claim to be reformed to protect them when they deliver aid to isolated regions. The sustainability of this approach is questionable, and may undermine government efforts to bring armed militias under control. The presence of militias also presents opportunities for terrorism recruitment, which is being monitored by Malagasy and international partners. All these factors have influenced how development and aid programs have been delivered, and show how political instability can effectively stifle development.

During the last 30 years, humanitarian aid and ancillary development projects have focused on short-term emergency response to crises as they arose. This approach may be impeding longer-term development goals by diverting resources and attention from priority investments needed for sustainable development, including education, health, livelihood development, regional transport planning, and regional water infrastructure. Moreover, humanitarian aid, even on its own terms, may not be of significant help to victims of famine and drought because much of it is diverted from the intended beneficiaries.

The increasingly shorter rainy season and longer dry season have implications for all sectors, from domestic users to livestock and agriculture. Some farmers accept that they will have to switch from maize, which requires significant amounts of rainfall, to more climate-appropriate crops such as sorghum, millet and beans. However, farmers have criticised the quality or productivity of some new crop varieties. Good quality and certified seed varieties are often in short supply, so local NGOs cannot always support farming communities requiring these seeds. Under the current circumstances, with their continued dependence on agriculture, undiversified economy, and low per capita GDP attached to low government and private sector investment, it will be difficult for the population of the Deep South to counter the adverse effects of climate change.

For the situation to improve, drought-tolerant crops varieties will need to be grown at a commercial scale throughout the region, and poorly managed, ad hoc projects and seed distribution systems will have to be ended. Serious strategies for irrigation will need to be developed, with communities, the state and potential private suppliers working together to address water issues. Production systems could include groups of farmers, larger commercial units, leasing schemes, or even diversification partnerships that enable the use of sisal plantations for irrigated food production.

Agricultural pests and diseases associated with climate change will require that the population be educated in integrated pest and disease management, as well as the development of pest- and disease-resistant crops. These services should be provided by permanent and structured national agricultural research and extension agencies, which would also monitor food production in advance of potential famine.

Various agencies have responded to water scarcity in the south by supplying water storage facilities. Water stored in these facilities can be distributed later as required. However, there have been allegations of corruption in water provision services. The Government and AES have recognised the problems with the system and view the situation as not sustainable. The Government is in the process of restructuring AES as an agency that would oversee the private management of water supplies. However, this approach will only be successful if local participation and transparent processes are enforced.

The Deep South's food and water scarcity will become direr as the population increases to double its current size by 2050, also putting more pressure on land and other resources. Family planning will need to play a role in reducing population pressures. In addition, more private sector-led investment will be required to help grow and diversify the economy, while an adequate social safety net is maintained.

There is also a need for better forecasting of extreme climate events. This will require more weather stations in all parts of the country, as well as improved weather forecasting information systems and international cooperation on meteorological issues, with key indicators cross-referenced with agricultural production. The Integrated Phase Classification (IPC) for food insecurity is in the process of being adopted for famine alerts in the Deep South, replacing the former SAP system, which had many deficiencies related to representativeness of locations and data collection processes. The new IPC system will make possible an integrated approach using indicators such as rainfall, agricultural production, and price of water sold by local people. Most importantly, the south needs a sustainable development strategy that is informed by IPC inputs.

The increasing use of fire to clear land for sedentary agriculture has led to the loss of vast dry and spiny forest areas with high biodiversity values. In the past, established protected areas were rarely affected by such fires, both inside and outside of PAs. However, recent satellite imagery shows increasing pressure on all forested areas. This trend is likely to continue as long as the economy remains undiversified and the population is dependent upon agriculture, while some private companies continue to use large areas of land for sisal production, although this provides local employment. The rapid loss of forests across the Deep South is of concern not only for nature conservation, but also for the loss of potentially important forest livelihood resources. Land use needs to be balanced among biodiversity conservation, commercial-scale sisal production, the necessity of food production, and other activities that will contribute to the region's economic growth.

Humanitarian agencies have at times used food-for-work programs to replant forests in famine-affected areas, but these replantings have often been unsuccessful as the climate is often much drier today than in the distant past, when these forests established themselves, while there is limited or no maintenance of these young plants. In addition, some NGOs have complained that this ad hoc approach has disrupted longer-term conservation efforts carried out in cooperation with communities. To be sustainable, nature conservation efforts need to encourage the empowerment of villages, good governance and fund existing forest associations or VOI. In creating such associations, however, NGOs need to take care that their projects do not exclude those who are not members of the associations. Rather, NGOs and donors need to take a strategic regional approach to sustainable development that supports entire communities, not just those who are active in their projects and programs.

The parameters of humanitarian and development aid need to be clearly defined so as not to crowd out private sector initiatives, particularly those by small-scale farmers and traders and women entrepreneurs. Support for these initiatives could be channelled through local partners with experience in providing business and technical support to micro start-ups, including the development of a money transfer system to facilitate payments. The poor in the south of Madagascar, as elsewhere, are strong and resilient, and are keen to develop intuitive solutions for themselves that are appropriate to their culture and circumstances. In time, these small investments could become the basis for developing the south's economy.



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