

THE DEEP SOUTH

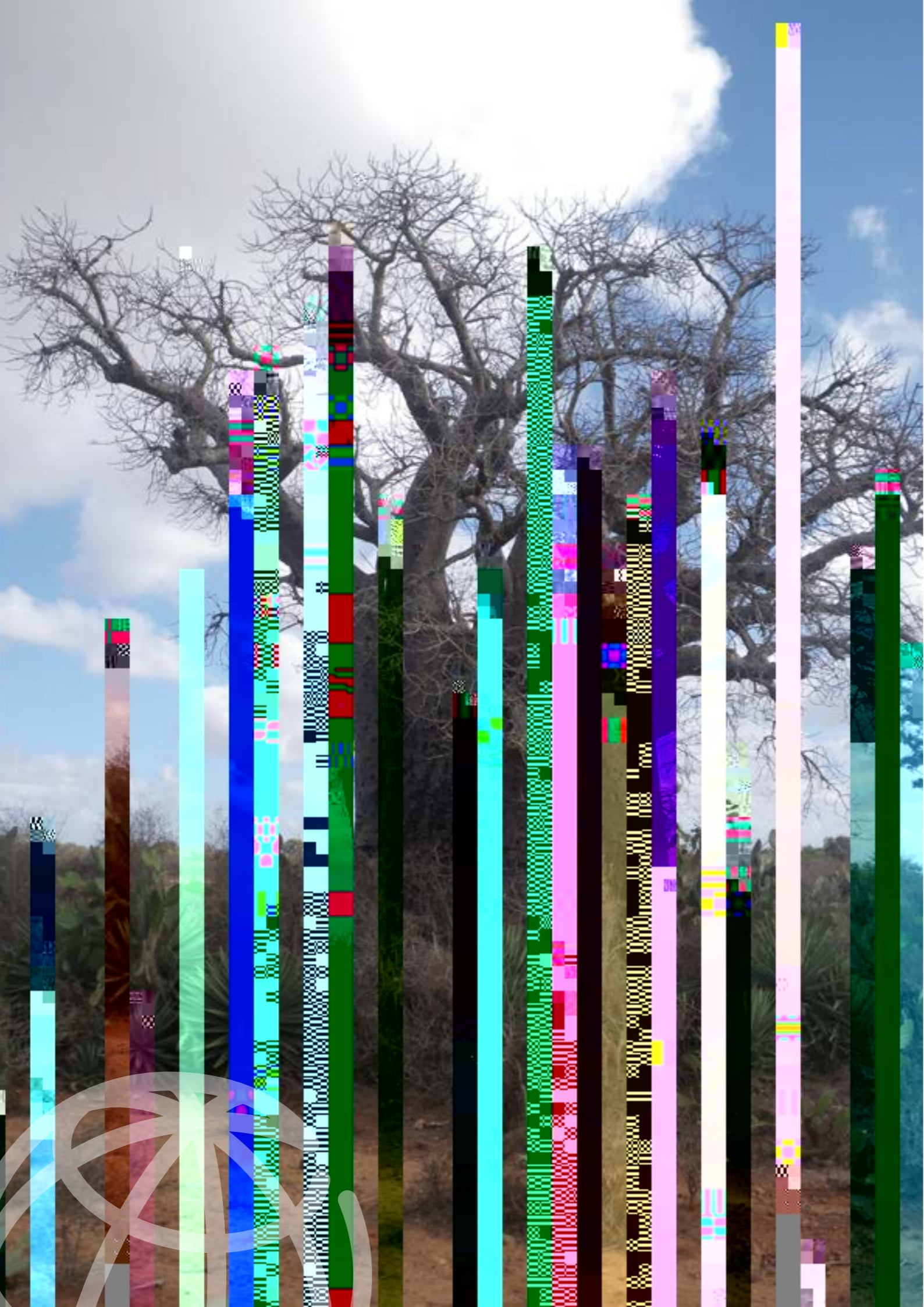
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The Deep South is a holistic study which proceeds through a historical perspective of the constraints and opportunities for the populations of southern Madagascar in nine districts within Atsimo Andrefana, Androy and

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

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

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).

Madagascar is a signatory to both the United Nations Framework Convention on Climate Change and the Kyoto Protocol. Although Madagascar's National Adaptation Programme of Action was adopted in 2006, institutional progress on climate change has been slow due to limited finances and '



Figure 2a: Population trends in Madagascar: Total population (blue line), total rural population (dotted yellow line),



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

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

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 CSBs². Due to the remoteness of modern clinics, many people treat themselves for non-serious illnesses.

Child mortality in M20>>> BDC <0003>TJEMC 1.135 0 Td<-017300E50178>1 <0E>gasca -3E5ch pE (clinic0 d8 (videcen)4 (l)297.9 (with dinsul)4(ts 9 (y)2rresponsh din38 (w)14iml)29 (clinic0 n (ven ri1780d[see Sec1780 (y)27 (in M223ices f)8 (or)22 (3r)10the c)1 (ta)7 (

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
- Both	41.2	12.7	31.8	30.2	45.5
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
Both	53.5	26.4	40.8	43.7	71.6

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

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 (P0) and poverty intensity (P1) in 2012 (%)

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

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



The Karembola and Mahafaly often identify themselves as Tandroy when traveling outside the south. The Tandroy

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.

The 17th century saw the solidification of many of the cultures and clan structures that are observed today, notably

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

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).

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

t h e a r e a s a r e a l s o o f t e n i n a c c e s s i b l e t o s e c u r i t y p e r s o n n e l

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

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

Fig 3i: Anomali4ofra18©B6Y©B6a0 0

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 in Madagascar between 2000 and 2050 based on 4 models

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 cen

Due to periods of instability during the 16th and 17th centuries, settlements in river valleys shifted to more isolated

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 km² located in the east and rising from the

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

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) to Tsiombe

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 Aion (At RuralOY)

process of restructuring AES as an agency that will oversee the private management of water supplies while working

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



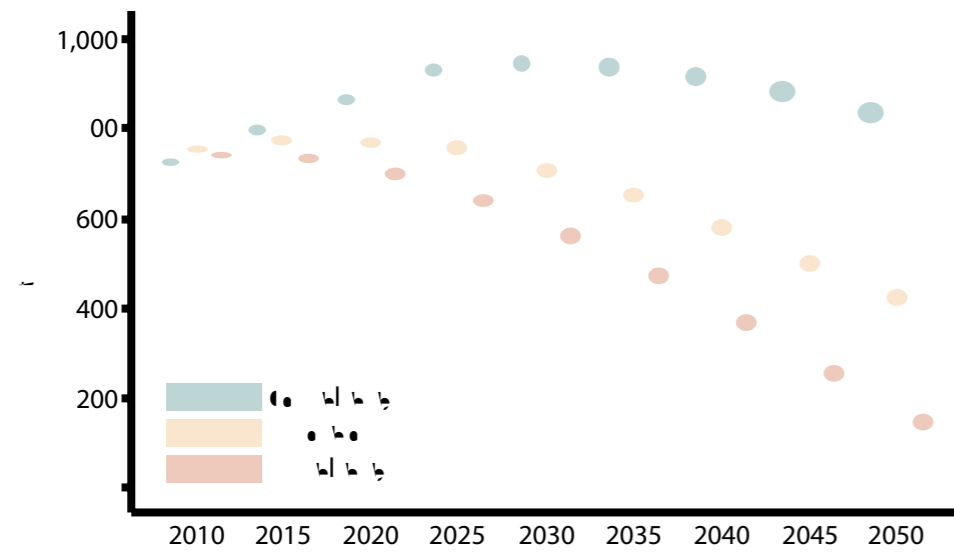
Source: Ministère de l'Agriculture /DSAPSE/Statistique Agricole; World Bank, 2016.

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

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climate scenarios for period 2010–2050

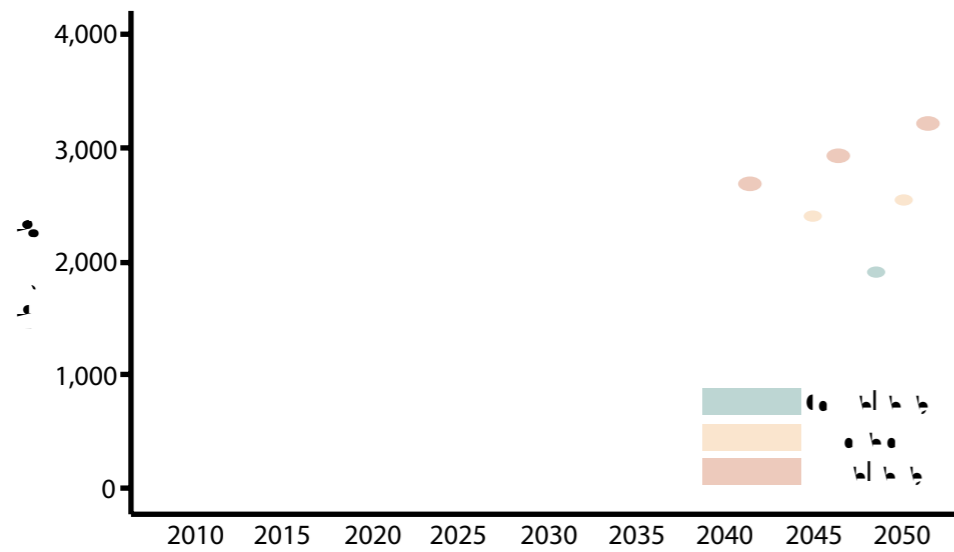


Source: Based on analysis conducted by Nelson et al., 2010; and IFPRI, 2013.

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



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



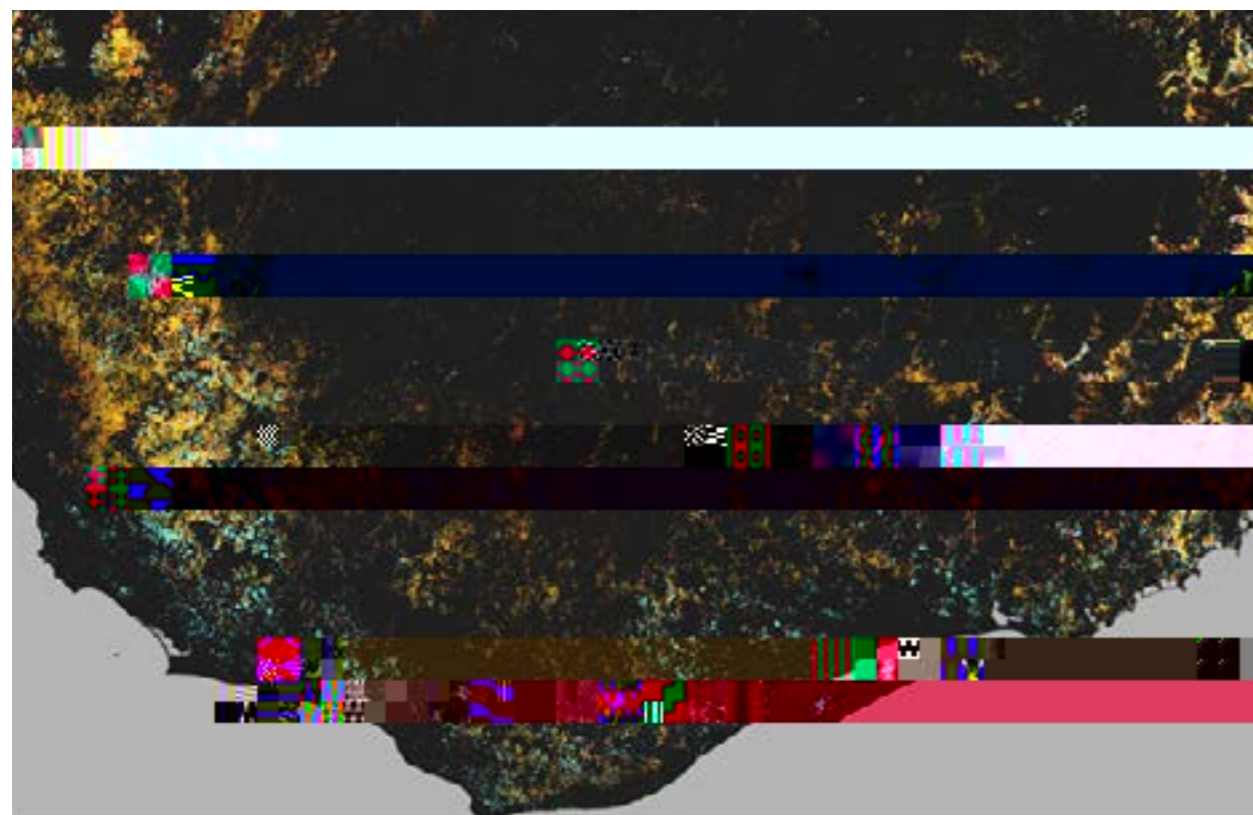
The number of fires in the Deep South shows curious increases and rising curves near the beginning of political instability in the country during 2001-2002 onwards; and from 2010 the curve appears to almost continue to rise into 2014.

Source: Earth Data – NASA, 2001-2014

Deforestation and the loss 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

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.

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.

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



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 tē ng

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



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

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