



The red dust in South Madagascar, on a path to Isalo.

Source: Moongateclimber. <http://commons.wikimedia.org/wiki/File:Madagascar-red-island.jpg#filelinks>.

Greening the Red Island

Tensions between Rural Development and Environmental Conservation in Madagascar

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ABSTRACT

As in many low-income countries, Madagascar's development trajectory is at an important crossroads. On the one hand the country faces severe, debilitating and chronic poverty problems, a function of economic stagnation, weak and damaged infrastructure, growing population numbers and poor levels of health, governance, education and overall human development. On the other hand both nation and world are becoming acutely aware of the unprecedented levels of deforestation, species extinction and biodiversity loss that plague the island's fragile ecosystems and landscapes. How the country approaches the challenge of meeting the basic human needs of its population without encroaching on the resources and well-being of future generations will require immediate and aggressive action, informed analysis, and systems-based sensibilities that highlight the important interplay between economic growth and environmental sustainability.

This report will present a set of policy interventions designed to improve the lot of Madagascar's most impoverished citizens – representing a staggering 70 percent of the population. It will examine the expected effects of these interventions using the help of International Futures version 6.36, a development forecasting tool. Improving rural infrastructure and thus agricultural yield demonstrates that aggressive and strategic investments have the potential to drastically alleviate poverty in Madagascar.

Finally, the report will conclude by introducing the concept of “unintended consequences” in poverty reduction strategies, particularly as they relate to environmental impact. It will posit that a stronger focus on environmentally friendly economic growth (particularly by bolstering green agricultural practices) may help alleviate – though not completely cure – some of Madagascar's most pressing challenges without taxing the welfare and development of future generations.

INTRODUCTION: THE RED AND THE GREEN



The colors of the Republic of Madagascar's flag – red, green and white – may offer a useful (or at the very least an interesting) basis to conceptualize the country's development history and trajectory. When the flag was first created in 1958, the red and white were borrowed from the ancient Merina kingdom, under whose monarchical rule the island's residents were gradually united throughout the course of the nineteenth century. On the other end of the spectrum, the green stood as an historic symbol of the *hova* people – the masses, commoners and peasants. Since the island's independence from colonial France in 1960, modern day interpretations of the flag have evolved to offer a new different meaning, with red representing sovereignty, white purity, and green hope. (Randrianja and Ellis 2009: 200-204)

Today, as the once-isolated island nation finds itself increasingly embroiled in world affairs, the target of numerous international economic development studies and the site of debilitating and violent social and political unrest, the colors of the flag may once again offer added meaning. The fourth largest island in the world (after Greenland, New Guinea and Borneo), Madagascar once boasted extraordinary levels of biodiversity, green rainforests and lush, fertile terrain which has powered the country's agriculture-driven economy. However, slash-and-burn farming techniques combined with commercial exploitation of the island's rainforest stock has transformed the Malagasy landscape, eroding and exposing the red-tinged laterite topsoil. Now dubbed the “Red Island,” Madagascar's government and citizens find the

country at an important crossroads: take dramatic and aggressive action to promote economic growth in order to lift significant portions of its population out of severe poverty, or protect its fragile ecosystems from the abuses of oft-environmentally-unfriendly development? (Kouwenhoven and Raharison 1999: 75) In accordance with much of the discourse framing environmentally sustainable development in least-developed countries (LDCs) like Madagascar, the country's leaders and citizens are now seeing "red" development pitted against "green" conservation paths.

This report proposes that both paths are not only possible but also most beneficial for Madagascar's future development, if combined effectively. Drawing primarily on the development forecast model designed by the computer simulation International Futures (IFs) of the University of Denver's Frederick S. Pardee Center, it will present scenarios for Madagascar's development by manipulating certain leverage points relating to its access to development assistance funds, its agricultural output and its physical infrastructure.

BEHIND THE NUMBERS

If, as the saying goes, "the numbers don't lie," the Republic of Madagascar's current state of affairs is bleak. World Bank's "Madagascar at a Glance" fact sheet reported the country's 2008 gross national income (GNI) to be US\$420 (compared to US\$1082 for Sub-Saharan Africa, the world's most poverty-stricken region).¹ Of 176 countries, Madagascar ranks 139th in terms of life expectancy at birth (an average of 59.9 years), according to the United Nations Development Programme (UNDP).² The Organization for Economic Co-operation and Development (OECD) reported in 2008 that 67.8 percent of Malagasy live in extreme poverty (that is, on less than USD\$1.25 per day), noting even more severe conditions for citizens living in the rural countryside and urban slums.³ The country's list of economic, demographic, infrastructural and governance problems seems endless. Meanwhile, foreign governments, international organizations, global financial institutions and transnational corporations continuously measure, dissect and report on the challenges Madagascar faces (or, in some cases, the potential it has to grow) as a developing country. As a result, understanding how the country arrived at this state of affairs, combined with an informed analysis of where it might be heading, is critical in defining and mitigating the main challenges it faces as it attempts to develop.

A Brief History

Once an "archipelago of localities," with communities isolated from one another by mountains, forests, savannas and desert-like areas, Madagascar's inhabitants unified gradually (though forcibly) in the nineteenth century under monarchs of the Merina people. (Allen 1995: 13) After a period of British and French competition during the "Scramble for Africa" of the late 1800s, colonial rule began in Madagascar in 1896 under the French, with Joseph Simon Gallieni acting as governor-general (1896-1905). The colonizers used political manipulation, force, and divide-and-conquer tactics to pacify local populations, depose the queen, and, by 1899, submit most of the country to French-style governance which Gallieni described as "une administration régulière" characterized by "benevolent" public works projects, services and assimilationist policies. (Gallieni 1900: 442)

¹ World Bank, "Madagascar at a Glance," 2009. See: http://devdata.worldbank.org/AAG/mdg_aag.pdf. 2009.

² United Nations Development Programme, *Human Development Report*, 2009. See: http://hdrstats.undp.org/en/countries/country_fact_sheets/cty_fs_MDG.html.

³ Organisation for Economic Co-operation and Development, "Madagascar," 2009. See: http://www.oecd.org/data_oecd/13/11/40578194.pdf. 2009.

Anti-colonial sentiment gained momentum throughout the 1900s, especially as profits reaped from exploiting the country's natural resources were diverted from local residents to the French government and large commercial companies. (Covell 1987: 19) A nationalist insurrection in March 1947 led to a months-long retaliation by the French, resulting in the execution or death of 100,000 Malagasy. In the following decade and under financial and moral pressure in the wake of World War II, the French passed a series of reforms in Madagascar (including the *loi-cadre* (Overseas Reform Act) in 1956 which granted Malagasy citizens voting roles). These culminated in the proclamation of the Malagasy Republic in October 1958 and its official independence in June 1960. (Ambassade de France 1960: 9) Since achieving independence, Madagascar has gained increasing visibility in international affairs and in addition to France, has gained economic partners in the United States, the European Union and many other OECD countries as well as transnational corporations like Coca-Cola. The country has also undergone severe bouts of political transition and turmoil and is currently in its Third Republic. Very recently, in 2002, the Malagasy experienced what historians Solofo Randrianja and Stephen Ellis dubbed a "low intensity civil war" as a result of highly contested presidential elections. (Randrianja 2008) Violence erupted again in February 2009 as a result of anti-government protests and a coup that removed democratically elected President Marc Ravalomanana.⁴ November 2010 saw yet another bout of political turbulence, with military officers under the leadership of Col. Charles Andrianasoavina claiming to have seized the government of President Andry Rajoelina. (Bearak 2010: A12)

Many agree that the prospects for political stability and economic prosperity in the country continue to this day to be fragile, though not unattainable.

Demography: Population Growth Needs Growth in Other Sectors

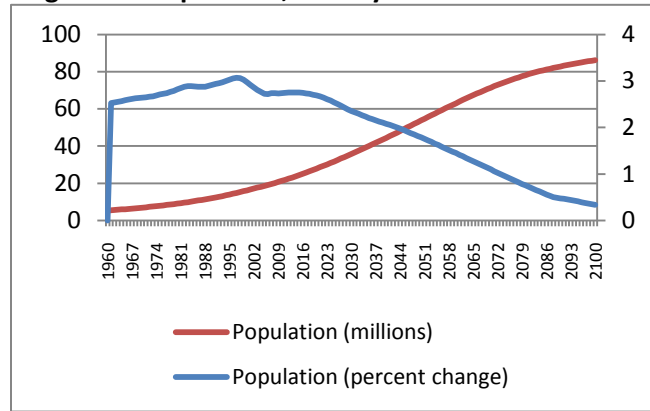
When the first census was taken by French authorities at the turn of the twentieth century, Madagascar's population numbered at around 2.2 million people. (Covell 1987: 52) In 2010, the World Bank estimates the Malagasy population to be 19.1 million, representing a nearly nine-fold increase in just over a century.⁵ By IFs "base case" estimates, Madagascar's population in the year 2100 will be 86.18 million, suggesting an increase in absolute population numbers of 84 million people over 200 years (or, in relative terms, over 39 times the estimated size of the population in 1900).⁶ Although demographic studies sometimes favor rates and trends, absolute numbers are also telling in Madagascar's unique situation as 1) an island-nation with an historically low emigration rate (0.9 percent in 2009) and 2) as a biologically diverse, agriculture-based economy with finite resources and carrying capacity. Though technology and behavioral changes may temper the effects somewhat, the strain large populations put on their surrounding ecosystems and natural resources should be seriously considered, not simply out of concern for the environment (though this is important in and of itself), but also out of concern for the ability of the land to sustain and feed citizens in the medium or long term.

⁴ BBC News. "In Pictures," 7 February 2009. See: http://news.bbc.co.uk/2/hi/in_pictures/7876932.stm.

⁵ World Bank, "Madagascar at a Glance," 2009. See: http://devdata.worldbank.org/AAG/mdg_aag.pdf. 2009.

⁶ International Futures, version 6.36.

Madagascar's Population, History and "Base Case" Forecast



Source: International Futures (IFs), version 6.36.

As the graph above demonstrates, Madagascar has been experiencing since 1960 steady population growth ranging between 2.5 and three percent; this is in line, though slightly higher, than sub-Saharan Africa's current growth rate of 2.3 percent.⁷ While absolute population numbers will increase steadily throughout the rest of the 21st century, population growth rates are expected to steadily decline, presumably as Madagascar progresses into later stages of demographic transition.

According to this theory, populations shift from high birth and death rates to low birth and death rates in stages as they develop from pre-industrial to industrialized economic systems. In stage one, death rates and birth rates are high and relatively in balance; stage two (that of a developing country) is marked by lower death rates through improvements in food supply, sanitation and overall health, without a distinct corresponding drop in birth rates; stage three sees birth rates then falling, in response to increased use in contraception, higher income and a gradual move away from subsistence lifestyles and higher focus on education; the final stage is characterized by low birth rates and low death rates. (Todaro and Smith 2009: 284)

Madagascar's demographic patterns suggest that the country falls somewhere in stage two. Since 1960, the crude birth rate (CBR) has fallen from 48.5 per thousand to 37 per thousand in 2005; the crude death rate (CDR) has seen a more drastic shift, from 24.7 per thousand in 1960 to 9.8 per thousand in 2005. (As a point of comparison, Germany, the quintessential "stage four" population, currently has in 2005 a CBR of 8.3 per thousand and a CDR of 9.6 per thousand.⁸) Since 1960, the total fertility rate (TFR) has dropped from around 7.3 children per woman to just less than 5 children per woman in 2005; similarly, due to improvements in maternal health care, infant mortality rates have dropped from 112 per thousand in 1960 to 67 per thousand in 2005; both are expected to decline by the end of the century, to 1.8 children per woman and 2.9 per thousand, relatively.⁹ Though these figures indicate that development in Madagascar will cause the population to eventually stabilize, they also suggest that this will take time. Extrapolating from the population forecast graph above, Madagascar's population may not reach stage four (meaning, the absolute population line will not "level out") until after 2100, suggesting that the CBR is expected to outweigh the CDR for nearly the next century – barring any political violence, famine, environmental catastrophe or other event unforeseen by the model.

⁷ International Futures, version 6.36.

⁸ Ibid.

⁹ Ibid.

Ideally, to protect current and future citizens from living in severe poverty Madagascar's economy would need to experience aggressive levels of growth, equal to (if not larger than) the population growth forecast presented herein. However, this statement obscures the fact that an overwhelming majority (67.8 percent, or nearly seven out of every ten people, according to World Bank Research Development Group) in Madagascar *already* live on less than USD\$1.25 per day, the World Bank's extreme poverty line.¹⁰ Madagascar's situation stands in stark contrast to the World Bank's 2005 estimate that only one quarter of the population of the developing world lives under this line. (Chen and Ravallian 2009: iv)

Meeting the basic needs of the population is a central concern in Madagascar's current development activities but is already placing a significant strain on its environment, as we will explore later in this report. However, as the country pursues more aggressive and resource-intensive economic "modernization" (in the form of urbanization and industrialization) and experiences absolute population growth, actions taken simply to meet the basic human needs of today may prove even more problematic, threatening to severely limit opportunities and resources available to the growing generations of Malagasy tomorrow.

Economy: The Poverty Trap

As suggested, Madagascar's economy has failed to meet the basic needs of its growing population, which has resulted in a staggering portion of citizens currently living on less than USD\$1.25 per day. Its USD\$9.46 billion economy, spread out over its current population of 19 million people, has resulted in a gross national income (GNI) per capita of USD\$420, compared to US\$1082 for Sub-Saharan Africa, the world's most poverty-stricken region.¹¹ At the individual and household level, the impacts of this level of impoverishment are multifold: extremely impoverished people face severe handicaps, according to World Bank specialist Quentin Wodon, including geographic and physical isolation, limited mobility, reduced academic and professional opportunities, potentially strained family and inter-personal relationships due to a lack of income, higher incidence of disease or premature death, and reduced access to basic resources such as food, shelter and water. (Wodon 2001: 2)

At the level of the economic system, the evidence suggests that Madagascar's situation fits economist Jeffrey Sachs' description of the "poverty trap" which characterizes many if not most African economies:

Africa's extreme poverty leads to low national savings rates, which in turn lead to low or negative economic growth rates. Low domestic saving is not offset by large inflows of private foreign capital, for example foreign direct investment, because Africa's poor infrastructure and weak human capital discourage such inflows. With very low domestic saving and low rates of market-based foreign capital inflows, there is little in Africa's current dynamics that promotes an escape from poverty. (Sachs, et al. 2004: 122)

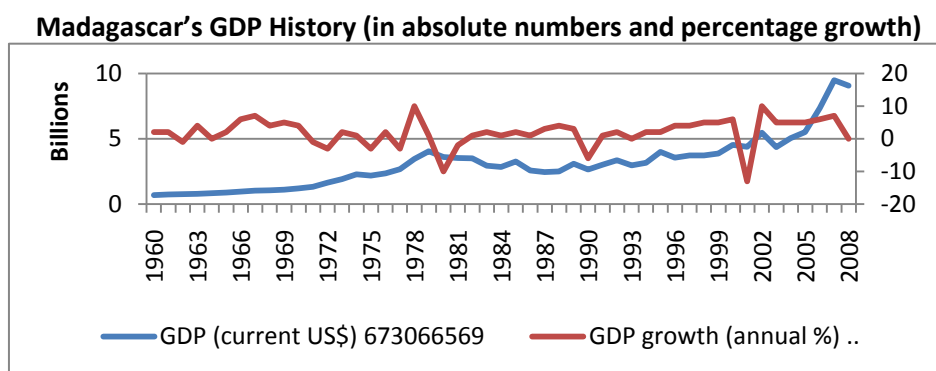
Sachs's concept drives us to a fairly obvious, though also highly applicable, conclusion: widespread extreme poverty breeds widespread extreme poverty. In addition to being the unfortunate victim of global economic downturns and political instability, Madagascar's stagnant economy is very well the cumulative result of a systemic problem, characterized by decades of little to no growth exacerbated and fed by low domestic savings and investment rates. Though data are limited, figures collected by the World Resources Institute showed Madagascar's Gross National Savings in 2000 at 7 percent (compared

¹⁰ For specific country data, see <http://data.worldbank.org/indicator/SI.POV.DDAY>.

¹¹ World Bank, "Madagascar at a Glance," 2009. See: http://devdata.worldbank.org/AAG/mdg_aag.pdf. 2009.

to 13 percent in Sub-Saharan African and 23 percent globally).¹² Since gross national savings calculate the difference between GNI and public and private consumption, plus net transfers (such as aid), this low number represents not only low levels of overall savings but also low levels of foreign investment.¹³ A final aspect in this equation is the role of an economy characterized by subsistence agriculture, which forms the basis of Madagascar's consumption patterns and markets: subsistence constraints severely limit households' ability to reduce consumption and thus increase savings and capital accumulation, placing individuals in a vicious cycle limiting savings, capital accumulation and, consequently, income growth and poverty exit rates.

We can visualize Madagascar's economic stagnation and discuss several trends by examining Madagascar's gross domestic product (GDP) per capita over several decades. In constant 2003 dollars, there was some, though limited, growth in GDP per capita in the economy over the period 1980 to 2003; the fact that this was measured in purchasing power parity suggests that since 1980, the ability of Malagasy to purchase an identical basket of goods and services with a certain amount of Ariary (Madagascar's currency) has strengthened. However, this improvement has been minimal: a 1998 World Bank report stated that Madagascar's GDP has grown at an annual average rate of .5 percent over the three preceding decades, outperforming only four countries: Niger, Nicaragua, Haiti and Kiribati.¹⁴ Though it does reflect movement towards alleviating poverty, this minimal growth in GDP per capita has resulted in little tangible positive impact for impoverished Malagasy.



Source: World dataBank, databank.worldbank.org, accessed 26 October 2010.

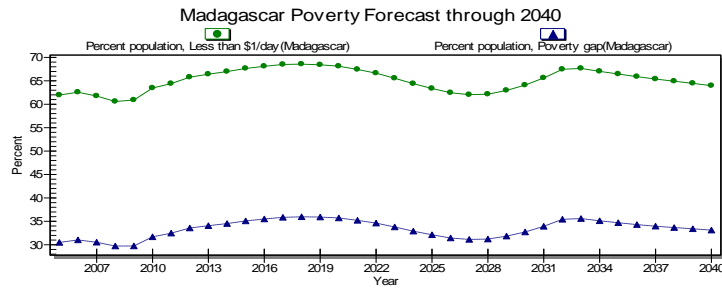
Madagascar's GDP fluctuations since 1960, as depicted above, give a magnified glimpse into the drastic (and often negative) spikes that have characterized the economy's economic growth. In the absence of corresponding data, this instability may perhaps also give added insight into the reasons why the Malagasy economy has been unable to attract significant and steady investment.

Unfortunately, economic forecasts suggest that the situation is worsening, with severe consequences for both the prevalence and the depth of poverty in the country. IFs's base case scenario is bleak:

¹² WRI, "Economic Indicators: Madagascar," See: http://earthtrends.wri.org/pdf_library/country_profiles/eco_cou_450.pdf.

¹³ Ibid.

¹⁴ World Bank, "Madagascar: An Agenda for Growth and Poverty Reduction," 1998. See: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/1999/07/22/000178830_98111703544931/Rendered/PDF/multi_page.pdf.

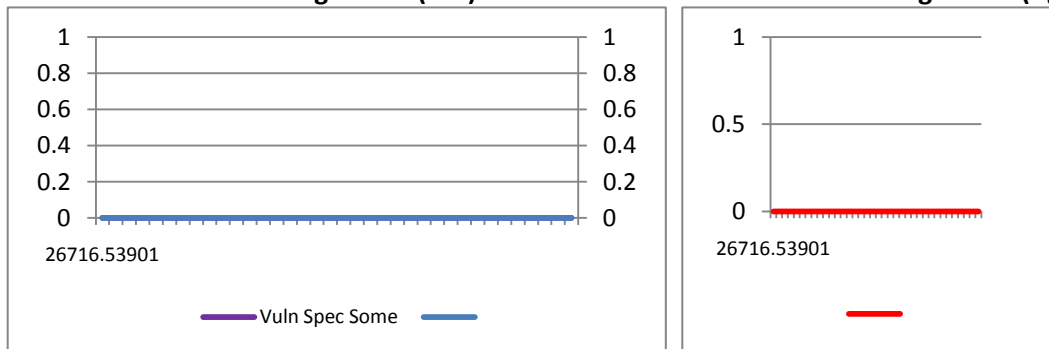


Source: IFs, v. 6.36.

The IFs model predicts the percent of the Malagasy population living on less than USD\$1.00 (even below the USD\$1.25 World Bank measure) will peak in 2020 at nearly 70 percent, dip slightly, then peak again in 2034. The graph also examines the poverty gap, which the World Bank defines as “the mean shortfall from the poverty line, counting the nonpoor as having zero shortfall.”¹⁵ It is expressed as a percentage of the poverty line, so that higher numbers suggest further distance from the indicated daily income and thus a higher severity of poverty. In this case the fluctuating poverty gap (peaking at 36 percent in 2019 and at 35 percent in 2032) is telling, suggesting that the distance between impoverished Malagasy households and the USD\$1.00 threshold will deepen before it narrows significantly, in a business-as-usual trajectory.

What do the fluctuations in the graph indicate? First of all, that Madagascar’s base case trajectory is clearly not one of aggressive, targeted poverty alleviation (if it were, we would likely see a more distinctly downward trend in both lines). Second, though the IFs model calculates its forecasts from base year 2005, its creators have worked the 2009 global financial crisis into the model; thus the first “peak” around year 2019 in both graphs may be an accumulation of years of negative economic impact that Madagascar’s poorest populations are expected to face as a result of global financial troubles. Third, the second “peak” in the 2030s is mysterious at first glance, especially since GDP is not expected to take a sharp hit as it did in 2009 (see left graph, below). However, the distribution of income in Madagascar is expected to become more unequal beginning around year 2034, as suggested by a noticeable uptick in the Gini coefficient. This may indicate that even as GDP and GDP per capita grow, uneven economic development may maintain (and in some cases, exacerbate) poverty levels by excluding the already impoverished. Though reducing fertility rates may help improve GDP per capita forecasts, the rising inequality in Malagasy society may block overall economic growth from delivering the “bottom rung” of the population from poverty without interventions targeted at this group.

Forecasts: GDP at PPP through 2040 (left) and Domestic Gini Coefficient through 2040 (right)

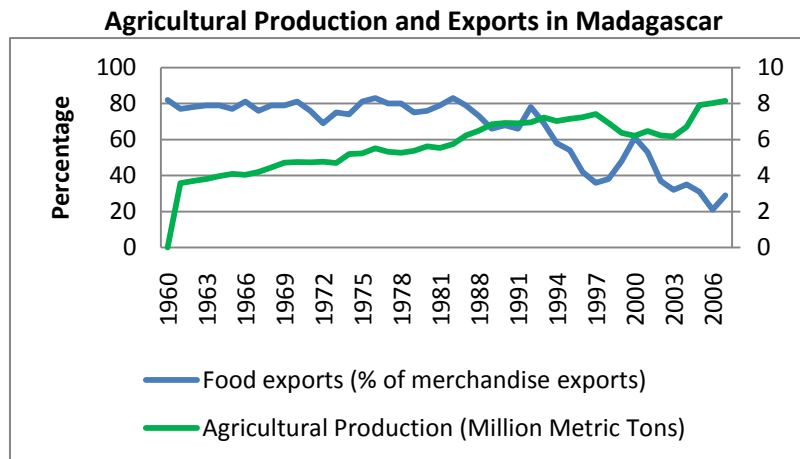


Source: International Futures, version 6.36.

¹⁵ For more information, see <http://data.worldbank.org/indicator/SI.POV.GAPS>.

Economy, continued: Agriculture and Rural Poverty

Agriculture, and particularly rice, cassava and maize cultivation, play a major role in the Malagasy economy as well as in feeding the population. For the country as a whole, about half of calories are consumed come from rice, suggesting that rice availability and prices have major effects on the welfare of rice farmers (about 60 percent of the population) as well as consumers (the entire population, essentially). (Zeller, et al. 2000: 5) Furthermore, Madagascar's agricultural sector produces 30 percent of national GDP and comprises 80 percent of national employment. (Dorosh, et al. 2001: 13) Up through the 1990s, agricultural production was on a steady rise and formed a considerable portion of the country's export market. A period of market liberalization beginning in the 1990s, however, was also marked by an eventual downturn in in agricultural production growth and the share of agricultural products in exports (see graph below).



Source: World dataBank, databank.worldbank.org, accessed 26 October 2010.

Interestingly enough, the very citizens that form the backbone of Madagascar's rural economy are also among the most impoverished: small acreage subsistence farmers and their households. Jean Claude Randrianarisoa of Madagascar's Centre National pour le Developpement Durable (Fofifa) and Bart Minten of Cornell University contend that "the dismal performance of agriculture in the last decades is strongly related to poverty in rural areas." (Randrianarisoa and Minten 2001: 4) By far the lowest returns to labor in Madagascar emerge in the agricultural sector: median monthly earnings in the primary sector are only equivalent to about 40 percent of those in the secondary and tertiary sectors. Furthermore, the difference in earnings corresponds to the relatively low labor productivity in the primary sector which, when defined as average output per worker, is less than 15 percent of labor productivity in the secondary or tertiary sector. (Hoftijzer and Paci 2008: 4)

As such, the overall economic welfare of Madagascar's rural population remains stagnant if not in decline, with many households below the necessary level of monetary and technological capital to be able to reap maximum agricultural yield from their small plots of land. Without a buffer created by extra capital, they face high exposure to asset loss which leaves them reluctant to undertake activities that increase these risks – such as experimenting with different crops, buying new technology or seeds, or even sending their children away from the farm to school. Furthermore, as subsistence farmers, they rarely have the option to increase savings by reducing consumption, further locking them into a poverty trap. (Barrett 2004: 2)

Poor Infrastructure as a Hindrance to Development

Madagascar's overall infrastructural profile is very weak, even by low-income country standards:

Selected Infrastructure Level Indicators, Madagascar vs. Low-income Economies vs. EU-27

	Madagascar	Low-Income Economies ¹⁶	European Union-27
Safe Water (expressed as percent of households connected)	6	14.72	95.7
Road Density (expressed as roads per 1000 hectares)	.8488	4.126	15.91
Road Quality (expressed as percentage of roads paved)	11.6	18.23	66.37
Electrification- Urban (expressed as percentage of urban population)	44.65	59.56	97.97
Electrification – Rural (expressed as percentage of rural population)	5	14.86	81.61
Networked Persons (expressed as percentage of total population)	.1989	1.925	20.82

Source: International Futures, version 6.36.

The table above shows us that insofar as strong infrastructure is a sign of economic development (since water and sanitation services, roads, electrification, and information communications technology (ICT) systems cost money), Madagascar as a whole, and especially its rural populations, are severely underdeveloped – not only because of low economic levels but also because of vulnerability and exposure to repeated climate shocks such as cyclones and flooding. Furthermore, if we accept the notion that poor infrastructure tends to exacerbate already-low health, communication, and mobility levels, Madagascar's low GDP (and associated low and ineffective government budget) exists in a positive feedback loop with its infrastructural profile – poor infrastructure is preventing the country from gaining wealth, and in turn low income levels are preventing the country from investing in infrastructure improvements. With rising GDP per capita in the long run, we may likely expect gradual infrastructure improvements in Madagascar, though a policy or fund designed to improve infrastructure immediately may help accelerate GDP growth and thus spur more focus on infrastructure in the long term (activating the feedback loop to boost, rather than hinder, Malagasy development as a whole).

Today, the island's agricultural markets are ineffective because of poor infrastructure and high transaction costs limiting trade and hindering efficient distribution. The relationship between high transaction costs and poor agricultural output is significant, and (rightly) often acknowledged as a lever in poverty reduction strategies for the country. An International Food Policy Research Institute paper from 2003 examines household survey data and administrative censuses to unearth the relationship between isolation and rural poverty. Its authors come to the conclusion that geographic remoteness (that is, physical distance from markets), and lack of access to financial and to agricultural input and output markets as well as well as public services, have a strong direct and direct correlation with rice and other crop yields, which has a positive effect on rural household incomes. (Zeller, et al. 2000: 13)

The state of Madagascar's roads in particular has recently become an increasingly important subject of analysis in development reports, including in the country's own Poverty Reduction Strategy document,

¹⁶ According to World Bank classification of "low-income economies." See: http://data.worldbank.org/about/country-classifications/country-and-lending-groups#Low_income.

the *Madagascar Action Plan 2007-2012* (MAP). The MAP emphasizes large-scale investments and improvements in the rural road infrastructure of the country, which is assumed to create better functioning input and output markets and thus improve agricultural productivity. (Government of Madagascar 2007: 37) While the government's objective is fairly straightforward, Dorosh et al. note, it nonetheless represents an ambitious and large project: in order for improved road infrastructure to have an important impact, it is not simply a question of paving a road in one village, but rather one of substantially improving the entire road network so that residents and businesses use it. (Dorosh, et al. 2001: 29)

In sum, the vast majority of Madagascar's rural population (76.7 percent) lives below the USD\$1.25 poverty line, and their economic well-being is strongly correlated to the growth of the country's largest economic sector, agriculture.¹⁷ As such, perhaps the most obvious leverage point for mitigating Madagascar's abysmal poverty levels is by promoting agriculture. However, the individuals and households who participate in this sector face enormous challenges which are difficult and costly to defeat (especially in combination with one another): low returns to labor, low levels of productivity, an inability to save in order to accumulate capital and technology, a declining share of the country's export market, environmental and climate vulnerability, poor infrastructure and geographic remoteness.

ECONOMIC POVERTY AND ITS EFFECTS ON HUMAN DEVELOPMENT

UNDP's Human Development Index (HDI) "looks beyond GDP to a broader definition of well-being." The index provides a multi-faceted measure of development, involving both quantitative and qualitative dimensions relating to health, education, standard of living, political freedoms and human rights. Madagascar's HDI value in 2007 was .543 on a scale from zero (representing the lowest level of human development) to one (the highest); of 182 countries, Madagascar's HDI value ranks in 145th place. Though this ranking puts the country several places higher than where it sits purely in terms of GDP per capita (166th place of 182), measures of human development in Madagascar still demonstrate much room for improvement.¹⁸

Standing in contrast to but also in accordance with the HDI, the Human Poverty Index (HPI) measures deprivations faced by portions of the population that fall below specified thresholds in certain areas of human development. Madagascar's HPI value is 36.1, ranked 113th of 135 countries. (United Nations Development Programme 2009) Human development and human poverty indices are useful in expanding the notion of Madagascar's poverty trap to extend beyond simple economic indicators and may reveal a strong interplay between poverty levels and health, education and governance. This section will explore some of the major components of the HDI and HPI – and investigate why Madagascar sits where it does in these global rankings.

Health: An Exception to the Rules?

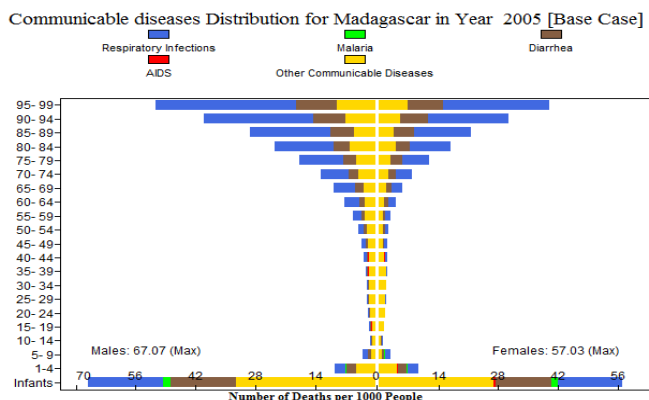
In many ways, Madagascar's health situation is anomalous for Sub-Saharan Africa. Unlike its most proximate neighbors on the African continent, the prevalence of HIV/AIDS (and its associated impacts on the working age population and national economic projections) is minimal. The AIDS death rate as a percent of the population is 0.5 percent and forecast to remain consistently low over the next several

¹⁷ Statistics accessed October 28, 2010 at <http://www.ruralpovertyportal.org/web/guest/country/home/tags/madagascar>.

¹⁸ United Nations Development Programme, *Human Development Report*, 2009. See: http://hdrstats.undp.org/en/countries/country_fact_sheets/cty_fs_MDG.html.

decades. Mozambique's, South Africa's and Tanzania's AIDS death rate, in contrast, are .394, .633, and .311 percent, respectively, several times as large as in Madagascar.¹⁹

The island nation's relative freedom from the HIV/AIDS epidemic, however, does not suggest it is completely free of other maladies, diseases or conditions that could have a system-wide impact on economic growth and function. As discussed earlier, infant mortality is high at 67.29 deaths per thousand, with a large portion of infant deaths due to diarrhea (15.3 per thousand) and respiratory infections (17.6 per thousand). Similarly, the older age cohorts are most afflicted by the same conditions:



Source: IFs, version 6.36.

Average life expectancy in Madagascar is a low 60.2 years, and IFs calculations forecast only gradual improvement: by 2020 life expectancy will be around 64.3 years and by 2040, 69.5 years. Malnourishment plagues the population, with 37.3 percent of children underfed (even though the number of calories per capita available per day is 2056, suggesting that malnourishment in Madagascar is perhaps not a result of food shortage but rather food insecurity – that is, lack of access and uneven distribution of food supplies).²⁰

While Madagascar's current and expected future health problems may not seem pressing to the point of posing severe blocks to economic growth, the typical Malagasy citizen loses several years of economically productive life due to disability, particularly as a result of water, hygiene and environmental problems. In 2002 the World Health Organization (WHO) estimated 22 disability-adjusted life years (DALYs) per 1000 people from indoor air pollution alone, and 33 DALYs per thousand from diarrhea.²¹ It therefore may be interesting in other analyses to examine in detail the role increased rates of urbanization and environmental degradation (holding access to water constant) will play on Madagascar's life expectancy and DALYs.

Education: Needed, but to what Extent?

One of the eight poverty eradication targets set by the United Nations' Millennium Development Goals is to "ensure that, by 2010, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling."²² Unfortunately Madagascar is not on path to achieve this goal: the base case projection for year 2025 (allowing 10 years after the target) indicates that 3.6 million children between

¹⁹ International Futures, version 6.36.

²⁰ International Futures, version 6.36.

²¹ More information available at <http://www.who.int/en/>.

²² <http://www.un.org/millenniumgoals/education.shtml>.

the ages of ten and 14 will have received no education whatsoever, and 1.7 million children aged 15 to 19 will have had no schooling either (primary education included).²³

Though education, academic progress and intellectual self-fulfillment certainly hold intrinsic value, the Malagasy economic system and unemployment structure neither incentivize children’s primary education nor provide a wealth of opportunities for those with secondary education or advanced degrees. In a subsistence agricultural economy whose main asset is labor, households may feel that children and teenagers are better put to use performing farm work than studying a classroom. The following data, pulled from Peter Glick’s analysis of a National Household Survey conducted in 1993-4 by the National Statistics Group INSTAT, show unemployment rates by education level for urban men and women aged 15 to 30 in Antananarivo, Madagascar’s capital:

Urban Men and Women Age 15-30: Unemployment Rate by Education Attainment

Highest Degree Obtained	Men	Women
None	10%	14%
Primary (CEPE)	24%	12%
Secondary	28%	47%
Other Secondary	19%	10%
University	14%	39%

Source: Glick, *Patterns of Employment*.

These data demonstrate that even in an urban setting (and imaginably more so in a rural, agricultural environment), those who had completed primary and secondary-level education also faced the highest unemployment rates. (Glick 42) Nationwide, employment rates are highest among those with absolutely no education (93.2 percent), and employment rates fall steadily as education level rises, up through secondary education. (Hoftijzer and Paci 2008: 38)

For those educated Malagasy who do find a job, however, the monetary rewards are evident. Education level strongly determines the likelihood of obtaining a “good” job (meaning that a higher level of education is associated with the smaller probability of being employed in agriculture (where earnings are lower) and with the higher chance of obtaining formal employment. In 2008, wage workers with a primary education earned 23 percent more than wage workers without any education. While the returns to primary schooling were 12 percent for nonwage workers and 8 percent for those in agriculture, wage workers with an upper secondary education earned 69 percent more than those without schooling, while those with postsecondary schooling earned, on average, 105 percent more. (Hoftijzer and Paci 2008: 55)

However, while educational attainment may be an important way to help *individual* Malagasy into higher levels of income, it is generally those who exceed a certain threshold of income in the first place who receive secondary and tertiary level education (and in some cases, even primary education). In the short-term, income in Madagascar will continue to be tied directly to the agricultural and informal sector, which “favors” little to no education. Furthermore, though emigration in Madagascar is low, it may come as no surprise that those with university-level education comprise a significant proportion of Malagasy emigrants, contributing in large part to “brain drain” in the country. For instance, World Bank estimates from 2000 indicate that the emigration rate of tertiary-level educated Malagasy was 7.6 percent, meaning that more than one in 13 individuals with university degrees left the country in that

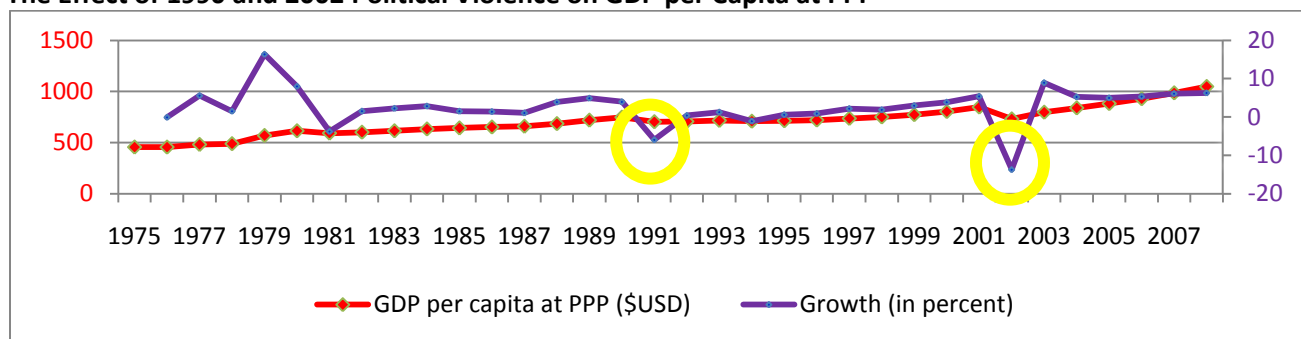
²³ International Futures, version 6.36.

year for destinations such as France, Canada, Italy and the United States. Nearly four in ten (39.2 percent) of physicians trained in the country, and almost three in ten (27.5 percent) of nurses trained in the country, emigrated in the same year, representing a veritable brain drain in Madagascar’s medical sector in particular.²⁴ As such education might not offer the most direct and effective path to alleviate poverty at a wide scale in Madagascar, especially in the short- and middle-term.

Political Instability: Can Economy Grow in Spite of Crisis?

Madagascar’s violent and volatile political history provides an important basis from which to inspect human development and poverty. To a certain extent, the country’s recent political crises – including the violent suppression of a 1990 protest against then-president Didier Ratsiraka, and then the 2002 ousting of President Marc Ravalomanana by Ratsiraka – have had real economic impacts, reflected by the sharp negative spikes in the blue economic growth curve in the following graph:

The Effect of 1990 and 2002 Political Violence on GDP per Capita at PPP



Source: IFs Database

Prior to the 2001 crisis, the period between 1997 and 2001 saw average economic growth at an impressive 4.6 percent, which increased living standards nationwide (although the benefits were largely concentrated in urban areas). In the aftermath of the crisis, net inflows of FDI were reduced to less than 10 percent of their previous level, exports faltered, and infrastructure was destroyed; as such GDP fell by around 13 percent in 2002 compared with the year before. One striking effect of the crisis was the massive inflow of labor back into agriculture from the secondary and tertiary sectors, which had the effect of lowering productivity and income per capita in agriculture. Between 2001 and 2005, the share of agricultural workers increased by eight points to nearly 78 percent, increasing the already-high number of primary sector works by about one-third. (Hoftijzer and Paci 2008: 28)

The next bout of political crisis in early 2009 even led the World Bank to publish an economic update report in 2010 titled, “Why has the Malagasy Economy Not Yet Collapsed?” In January 2009, Antananarivo mayor Andry Rajoelina declared himself in charge of the government, ousting President Ravalomanana (who had been re-elected in 2006) and sparking violent waves of anti-government protests and retaliation. (Bearak 2009: A6) The World Bank update posits that a strong performance by the rural sector combined with heightened flows of aid helped the economy avoid collapse, though economic indicators continued to suffer. (World Bank 2010) In each outbreak of political violence, we see a strong role played by the primary sector in either absorbing workers or upholding the overall economy in the aftermath; on a darker note, however, the entire economy – including the primary sector – also takes a serious hit after outbreaks of political crisis.

²⁴ Data available at <http://siteresources.worldbank.org/INTPROSPECTS/Resources/334934-1199807908806/Madagascar.pdf>.

It of course remains to be seen what degree of impact the most recent military coup, which occurred on 17 November 2010 (two days before the time of writing), will have. (Bearak 2010: A12)

Governance: Larger Trends

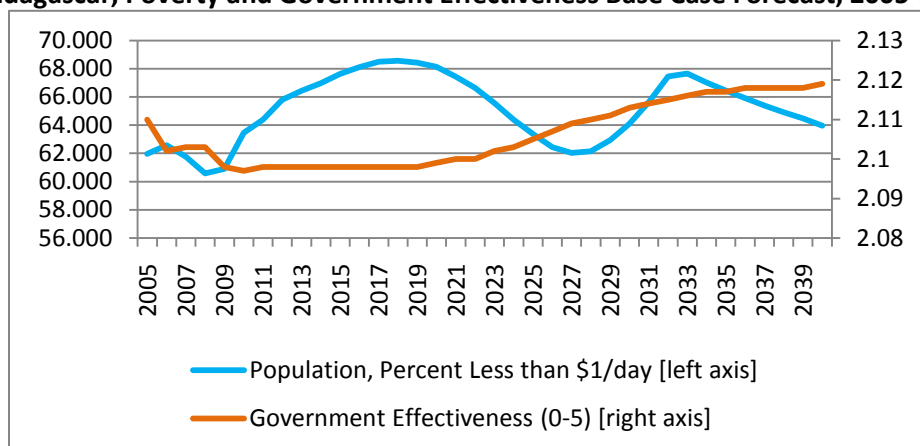
Given such a volatile and unpredictable political environment, it is easy to contend that economic growth will continue be hindered until governance and real democracy in Madagascar improve. Indeed, lower rates of corruption and high political stability could pose a negative impact on government waste and make the economy more secure, particularly in a LDC like Madagascar where a significant portion of the economy is holstered by foreign aid. On a larger and longer scale, as Dani Rodrik of the National Bureau of Economic Research notes, “participatory and decentralized political systems are the most effective ones we have for processing and aggregating local knowkledge. We can think of democracy as a meta-institution for building other good institutions.” (Rodrik 2000: 10) After all, even traditionally econo-centric members of the development community – such as the World Bank and International Monetary Fund – have in recent decades begun to quantify and place a stronger emphasis on human and social capital, political participation, governance and democracy levels as indicators of development. They embrace the concept that development strategies that focus on “soft” development (rather than hard economic growth) can drastically improve quality of life, improve access to new technologies and credit, produce higher-quality public goods, make markets function more efficiently, and nurture civil society. (Todaro and Smith 2009: 88)

We have seen that corruption, political instability and turbulence can severely *stunt* economic growth. The question then becomes: can improving human capital and social and political structures translate into reality and hard economic growth in Madagascar?

The country became a democracy in 1960 when it gained independence from the French and, as mentioned earlier, had been under more than a half-century of French-style, centralized administrative governance. The Republic of Madagascar today is a unitarian State, consisting of the central state, decentralized authorites in 22 regions and over 1500 municipalities and 17,000 fokontany, the basic administrative unit at the most local level (usually composed of groups of villages). Despite a decentralized political skeleton and growing liberalization, however, Madagascar’s political situation continues to be characterized by growing political tension (particularly within the ruling elite), the limitation of civil liberties, the quasi-dominance of a single ruling party, opaqueness in the management of public activities and spending, and severe problems with democratic transitions. In a micro-level social context, those who are victims of poverty (such as the rural poor, women and minorities) exert only a limited influence on public life in hierarchical Malagasy society – essentially excluding a vast majority from political participation. (Norad 2010: 9-13) A 2008 *Afrobarometer* survey confirmed that Malagasy people are concerned for their physical and economic security, have little trust in the government and its ability to use and distribute resources, do not parcipate in public life and are unsatisfied by the commune-style governance structure. (Frederickson 2010: 10)

The debate that emerges is then: to what extent will these trends continue? Will the currently ineffective government of Madagascar only do harm to development or can it do good? Conversely, is it a prerequisite that a larger portion of Malagasy society move out of poverty before a truly genuine, effective and participatory government can exist in the country?

Madagascar, Poverty and Government Effectiveness Base Case Forecast, 2005-2040



Source: International Futures, version 6.36.

The graph above plots forecasts of the percentage of the Malagasy population living on less than USD\$1 per day against expected, business-as-usual improvements in government effectiveness on a scale of zero to five, with higher numbers indicating more effective government.²⁵ Though government effectiveness in Madagascar is expected to increase gradually, the indicator remains relatively poor (the United States and France are both expected to reach government effectiveness levels of 5.00 (the maximum) by year 2040). In comparison to similarly underdeveloped countries, Madagascar’s forecast also poses a bit of an anomaly. Benin and Mauritania, Madagascar’s neighbors (holding the 134th and 136th slots, respectively²⁶) in the 2010 Human Development Index rankings, are expected to have government effectiveness levels of 2.21 and 2.27; Madagascar, falling out of line with the other two, is expected to have a value of 2.12.²⁷

Though the base case forecast does not necessarily bode well for those hoping to see significant increases in levels of government effectiveness through 2040, the graph does display an interesting trend. As poverty levels dip in the late 2020s, there is a corresponding discernible uptick in the level of government effectiveness. There is no evidence in the numbers to suggest the lower levels of poverty are *causing* improvements in government effectiveness or vice-versa (and because the myriad of literature on Madagascar’s governance situation is inconclusive). It may be nevertheless be safe to conclude that in the long-term, effective democratic governance and economic development in Madagascar will go hand-in-hand, in a positive feedback cycle where effective and stable institutions, transitions and public management aid – and are aided – by economic growth, reduced poverty levels and a more politically active population.

Environment: In the “Red”

In the pre-colonial past, when absolute population size and its rate of increase were lower, use of natural resources in rural areas to meet daily needs was more sustainable. This changed during the colonial period when land policies supported unsustainably high levels of resource use and extraction in

²⁵ Based on the World’s Bank definition: “government effectiveness captures perceptions of the quality of public services, the quality of the civil service and its degree of independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government’s commitment to such policies.” See: <http://info.worldbank.org/governance/wgi/pdf/ge.pdf>.

²⁶ See: <http://hdr.undp.org/en/statistics/>.

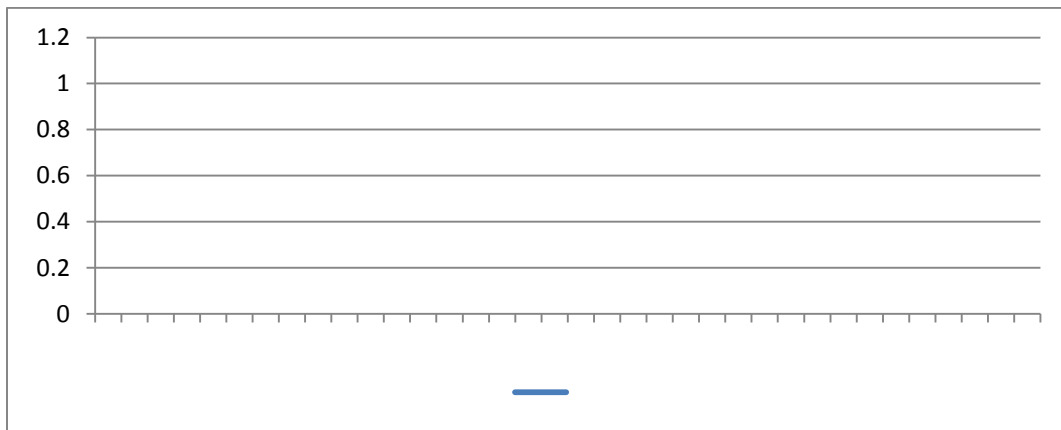
²⁷ International Futures, version 6.36.

some areas, particularly in the agricultural and mining sectors. During the post-colonial socialist era, increases in poverty and population size further contributed to unsustainable resource use. In particular, slash and burn agriculture (“tavy”) and clear cutting for firewood led to increasingly degraded natural environments and, in various locales, serious, irreversible biodiversity loss. Annually, a substantial part of the island is burned and deforestation continues at approximately 250,000 hectares per year. Consequently, a large proportion of the island’s initially-forested areas are presently deforested and much of the remaining natural forest is under threat. (Harper, et al. 2007: 323)

“Business as usual” forecasts regarding the levels of environmental strain, biodiversity loss and species extinction bound to occur from continued tavy practices and base case patterns deforestation, as well as the strain that absolute population growth will put on available land and water resources, are alarming. Harper et al use aerial photograph analysis to measure changes in forest cover: between 1950 and 2000, they estimate the decrease at almost 40 percent. The authors also undertake mapping studies to measure rates of forest fragmentation in Madagascar. As opposed to simple deforestation, forest fragmentation increases “edge effects” at forest/non-forest interfaces, and typically impacts an area of land several times larger than deforestation itself. They assess the impact of both processes (deforestation and fragmentation combined) as causing nearly (if not completely) irreparable damage to Madagascar’s biological and species diversity. (Harper, et al. 2007: 325)

Though the IFs model lacks compelling data regarding Madagascar’s unique environmental situation – that is, figures projecting expected loss in biodiversity, indigenous species or forest cover as a result of unsustainable farming practices and increased industrialization – it does forecast total environmental stress on Madagascar’s ecosystem using computations derived from a number of factors such as energy production, agricultural production, and carbon emissions. The base case scenario shows environmental stress (which is already unsustainably high in the country, according to environmental reports) increasing nearly twofold (by a factor of 1.96 to be exact) between 2005 and 2040 alone:

Base Case Forecast: Environmental Stress in Madagascar, 2005-2040



Source: International Futures version 6.36.

Why should this be of concern? This year the G8+5 environmental initiative group known as TEEB (The Economics of Ecosystems and Biodiversity) published a report making a strong case for the role environmental factors play in propping national and global economies and sustaining livelihoods. While it does not discuss Madagascar specifically, it makes a number of relevant and salient points, concerning

not just the intrinsic environmental value of conservation and sustainability practices but also their current and future economic value:

- “Maintaining stocks of natural capital allow the sustained provision of future flows of ecosystem services, and thereby help to ensure enduring human well-being”;
- “Few ecosystem services have explicit prices or are traded in an open market,” even though they provide economic value to those who use them; and,
- “We can no longer see the continued loss of and changes to biodiversity as an issue separate from the core concerns of society: to tackle poverty, to improve the health, prosperity and security of our populations, and to deal with climate change.”
(TEEB 9)

Examining and addressing Madagascar’s unique (though globally impactful) environmental challenges, therefore, are crucial elements in any serious and informed attempt to develop its economy, reduce poverty levels or generally promote human development at the expense of human poverty.

IN SUMMARY: MADAGASCAR’S MAIN DEVELOPMENT CHALLENGES: POVERTY TRAP, WEAK INFRASTRUCTURAL BASE, AND ENVIRONMENTAL DEGRADATION

Madagascar’s base case development forecasts raise serious red flags. Population growth coupled with political violence and a stagnant economy has launched a huge proportion of Malagasy citizens onto a path of chronic, difficult-to-escape poverty, with noticeable repercussions on rural populations and agricultural productivity. Furthermore, while the Malagasy government and population focus (understandably) on addressing the short-term, day-to-day survival needs of the island’s residents, Madagascar’s fragile ecosystem, air quality and water resources experience ever-increasing levels of environmental degradation. This fact bodes ill not only from an environmental standpoint but also from a health, well-being and economic standpoint for future Malagasy generations.

The first two major challenges listed above – debilitating poverty and poor road infrastructure, particularly in rural areas – are specific areas in Malagasy life that not only need to be fixed, but are also pressing or politically “sexy” enough to garner support from Madagascar’s own citizens as well as its international aid partners. The third, more long-term challenge – environmental degradation – represents an area that must factor into any Malagasy poverty reduction strategy, simply because rates of erosion, biodiversity loss and natural resource depletion are occurring at such a rate that will soon hinder the access that future generations have to Madagascar’s natural and agro-economic value.

While this set of challenges is by no means meant to be a comprehensive checklist of Madagascar’s needed areas for development, the items mentioned above are “big picture” challenges whose resolution may lead to improvements in other needed areas, including standard of living, life expectancy, educational attainment levels, governance and political stability.

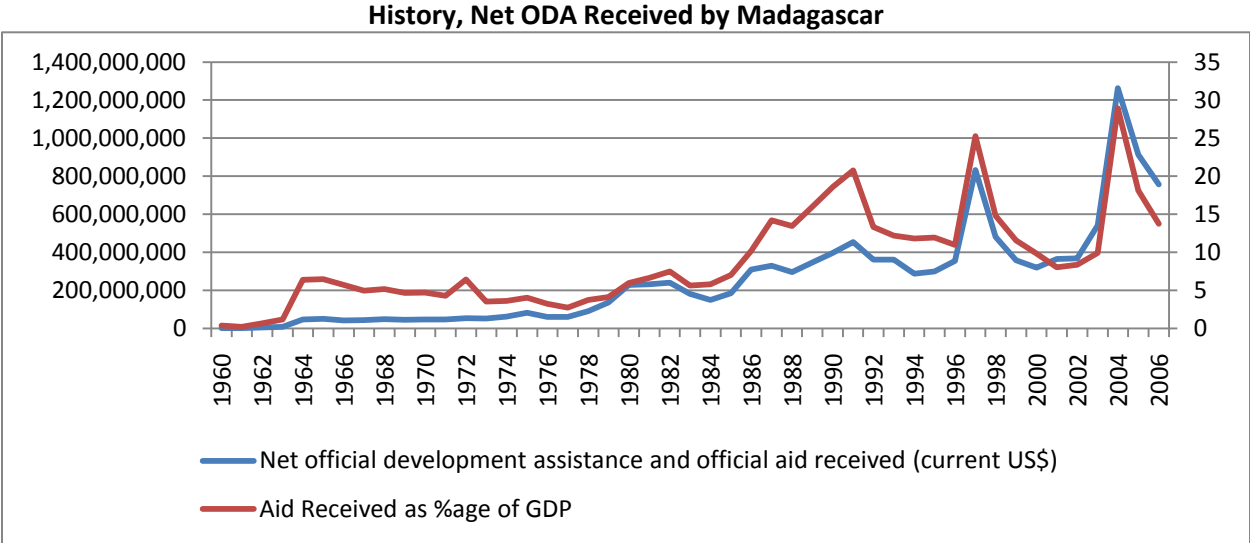
PAVING THE WAY FOR DEVELOPMENT

This section will explore the theoretical and historical role that development assistance, or foreign aid, has played in reducing poverty in Madagascar. Injecting development assistance funds into strategic sectors of the economy – particularly, this report posits, into agriculture – holds the potential to drastically alleviate poverty in Madagascar (compared both to the base case scenario as well as to interventions that do not target growth in specific sectors). It is with this approach in mind that we can explore the logic behind, and the high levels of current international and domestic support for, increased investment in rural road infrastructure on the island. The potential benefits behind increased,

consistent efforts for improving and maintaining Madagascar’s rural roadways provide a strong argument in favor of diverting time, capital, labor and government effort to support such an intervention. Further, by ramping up income, health and human development levels, the government of Madagascar in conjunction with its aid partners may be able to spark a major shift of the Malagasy economy towards industrialization and urbanization.

Examining the Theoretical and Historic Role of Aid

Given the recent slate of political crises and coups, the government of Madagascar has seen a large amount of committed aid withdrawn and prevented from reaching its coffers, precisely because of political governance and instability issues. Indeed, donor concerns are well-founded, often drawing on fears that funds given to unstable regimes and corrupt executives will be wasted. While political rhetoric and threats to cut off aid to Madagascar have received widespread news attention internationally, it is first important to consider how official development assistance from donor countries to the “Red Island” have failed to lift the country out of abysmal poverty.



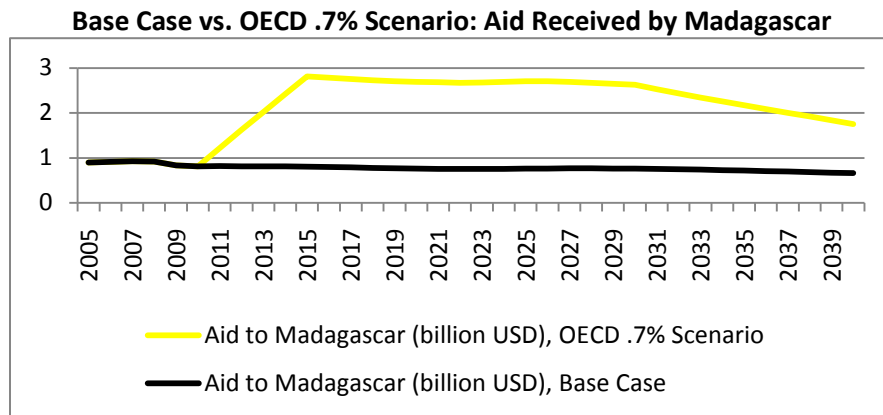
Source: World dataBank, databank.worldbank.org, accessed 26 October 2010.

Two schools of thought, epitomized on one hand by Jeffrey Sachs and on the other hand by New York University professor and economist William Easterly, would interpret historical aid flows to Madagascar presented in the graph above in two different ways. Sachs’s “big push” theory – namely, that low-income economies require an injection of capital to boost public investments and radically ramp up economic productivity (Sachs 123), might suggest that external assistance simply has not reached the threshold amount sufficient to kick-start the weak Malagasy economy given its levels of productivity, its main sectors and the demographic and health indices of its people. In addition, not only have ODA numbers been insufficient, but also inconsistent, ebbing and flowing according to the relatively small-scale political crises affecting the capital city in any given year. For his own part, Easterly might argue that aid simply is not an effective mechanism to reduce poverty; “the goal [of aid] is simply to benefit some poor people some of the time.” (Easterly 40)

Either way, there are very few statistics either confirming or completely discounting the role ODA has played in at least incrementally alleviating Madagascar’s poverty levels.

SCENARIO 1: Delivering on Long-Promised Aid

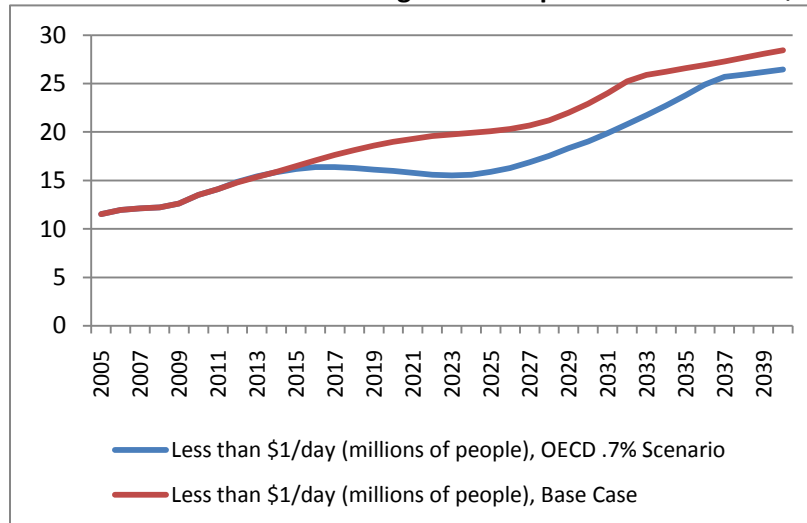
Wishing to explore the potential effectiveness of ODA in Madagascar in further detail, we can explore a scenario wherein all OECD countries deliver on their commitment (made in 1970 but never actualized) to have 0.7 percent of their GDP allocated as foreign aid. The intervention illustrated below (conducted through the IFs tool) models an aggressive ramp-up in OECD ODA between 2010 and 2015, from the base case level of around 0.205 percent (on average) to 0.7 percent. The 0.7 level is maintained through year 2030, and beginning in 2031 and ending in 2040 the percentage level decreases gradually from 0.7 percent to 0.5 percent. The graph below shows clear results in the amount of aid received by the government of Madagascar, with an uptick beginning immediately in year 2010, peaking in 2025, and falling slightly until 2040 (the time horizon of the intervention):



Source: IFs, version 6.36.

The intervention, though it has proven politically impossible to achieve in most OECD countries (and most importantly in the United States), translates into a decent level of growth in GDP per capita for the typical Malagasy citizen (GDP per capita at PPP will be USD\$1,454 in the working “OECD” file in 2040, compared to USD\$1,297 in the base case scenario), and significant reductions in numbers of people living below USD\$1.00 a day:

Base Case vs. OECD .7% Scenario through 2040: Population Below USD\$1.00/day



Source: IFs, version 6.36.

Still, however, this aggressive increase in ODA flows will not eradicate poverty in Madagascar by 2040. Furthermore, the country (as shown in the graph) will continue to see levels of poverty similar to the base case scenario through the year 2018, suggesting a time lag between increased ODA and actual, on-the-ground improvements and the continuation of abysmal poverty and suffering in Madagascar for almost the next decade, in spite of aid flows.

Nevertheless, the new and sustained flows of capital through 2040 that Madagascar would obtain as a result of OECD economies realizing their aid promises may be enlightening as we move to develop and articulate the second intervention in this report. Between 2010 and 2015 in the “OECD .7%” scenario, Madagascar will receive an additional USD\$6.036 billion from aid than it would otherwise; through 2028, it will receive an additional USD\$1.72 billion annually, on average – totaling an additional USD\$49.15 billion over the course of the entire intervention through 2040. These amounts provide us with an aggressive but reasonable “investment fund” that can guide sector- or population-specific interventions in order to promote economic and human development in Madagascar. Staying in line with earlier sections of the report, the following policy intervention will focus mainly on the primary (agricultural) sector and will maintain the objective of improving economic and living conditions for the “bottom 70 percent” of the Malagasy population – that is, those living in extreme poverty.

SCENARIO 2: On the “Road” to Development

There is no single “cure-all” leverage point for alleviating poverty in Madagascar, and efforts to develop the Malagasy economy have run the gamut from market openness to market closure; from agricultural sector-led growth to urban-led growth; and from attempts to achieve unbridled industrialization to extreme environmental protectionism, even at the expense of individual livelihoods. Today, however, an online literature review of current proposals for Malagasy development suggests a more balanced, strategic approach. One common leverage point in particular has been to kick-start the agricultural sector into higher gear by improving rural road infrastructure. This, as discussed earlier, can reduce transaction costs and increase efficiency and access to markets, allowing farmers not only to accumulate capital and foodstocks but also to distribute their products to larger portions of the population than the typical subsistence-driven economic structure would allow.

The investments needed to improve Madagascar’s rural road infrastructure such that it would have a significant positive impact on poverty levels, however, are high and (given the Malagasy budget) unaffordable. This means that outside assistance is necessary in providing the needed funds. According to a 1991 World Bank technical paper,

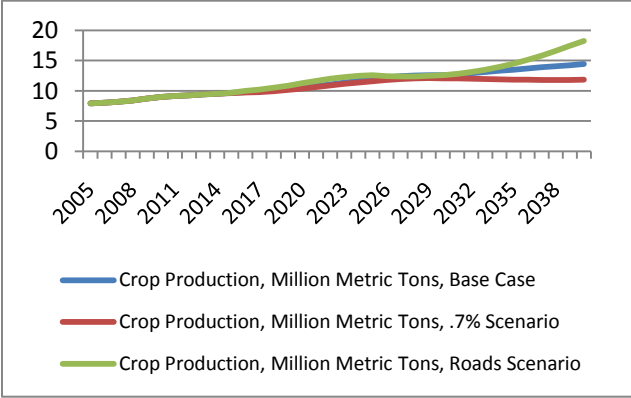
The funding needed to rehabilitate rural roads in SSA (Sub-Saharan Africa) are enormous, and a range of estimates has been made. The highest estimate calls for US\$2.5 billion per year for a ten-fold increase in the rural road network....For agricultural production to rise, the rural road network would need to be extended commensurate at least with the expected rate of growth of marketed agriculture and use of modern inputs. The need for network expansion can therefore be estimated on an average annual growth of 3 percent, for a total annual outlay of about US\$920 million a year or .6 percent of regional GNP. (Riverson, Gaviria and Thriscutt 1991: 5)

Though this assessment is nearly two decades old, the methodology proposed by it falls in line with smaller-scale rural road infrastructure project descriptions recently or currently being implemented in Madagascar and throughout Sub-Saharan Africa. (Benmaamar 2006: 5) In 2003, for example, the government of Madagascar began to implement a USD\$1.2 billion effort to improve a total of 22,000 kilometers of highways and rural roads by 2008, following the release of a study revealing that 33

percent of Madagascar’s communes did not have access to a highway and 30 percent lacked access to a provincial road. The project fell through early on, due to lack of funding and other priorities. (afrol News Staff Writer 2002) However, applying these numbers to current-day Madagascar, we can explore how drawing from just half (using a very generous estimate) of the USD\$6 billion available investment pool (created in the “OECD .7% Scenario) through 2015 and the continued flows in the years following in order to implement large-scale rural road infrastructure improvements in Madagascar can play a role in alleviating poverty.

Using IFs to introduce an intervention that would allow for an aggressive increase (by a factor of 1.5) in road density unfortunately results in a dead end.²⁸ However, a peer-reviewed document, Dorosh et al’s “Economic Motors for Poverty Reduction in Madagascar” written under the aegis of Cornell University, ascertains the potential effect of significantly improved road infrastructure on the agricultural sector in Madagascar. The authors posit that the simulated impact of road investments in Madagascar would create a 20 percent increase in productivity. (Dorosh, et al. 2001: 35) These statistics allow us to circumvent the technical issue with IFs and to introduce a “brute force” intervention to increase agricultural yield by 20 percent, reflecting the results of an aggressive intervention to drastically improve and keep maintained rural roadways throughout the country. Because improved infrastructure, furthermore, will prevent some loss of agricultural products due to spoilage or rotting, the intervention also incorporates a reduction in the loss rate of agricultural production.²⁹ As the graph below demonstrates, the “Roads” intervention will result in considerably higher levels of crop production by the year 2040. At 18.22 million metric tons produced in one year, it represents a 26 percent improvement over the base case crop production forecast in 2040 and a 54 percent increase over the “OECD .7% scenario” (this perhaps suggests that the funds coming from external ODA would not be channeled to encourage growth the primary sector, and might in fact lead to a downturn in agricultural production).

“Roads Scenario” v. “OECD .7% Scenario” v. Base Case : Crop Production through 2040, Madagascar



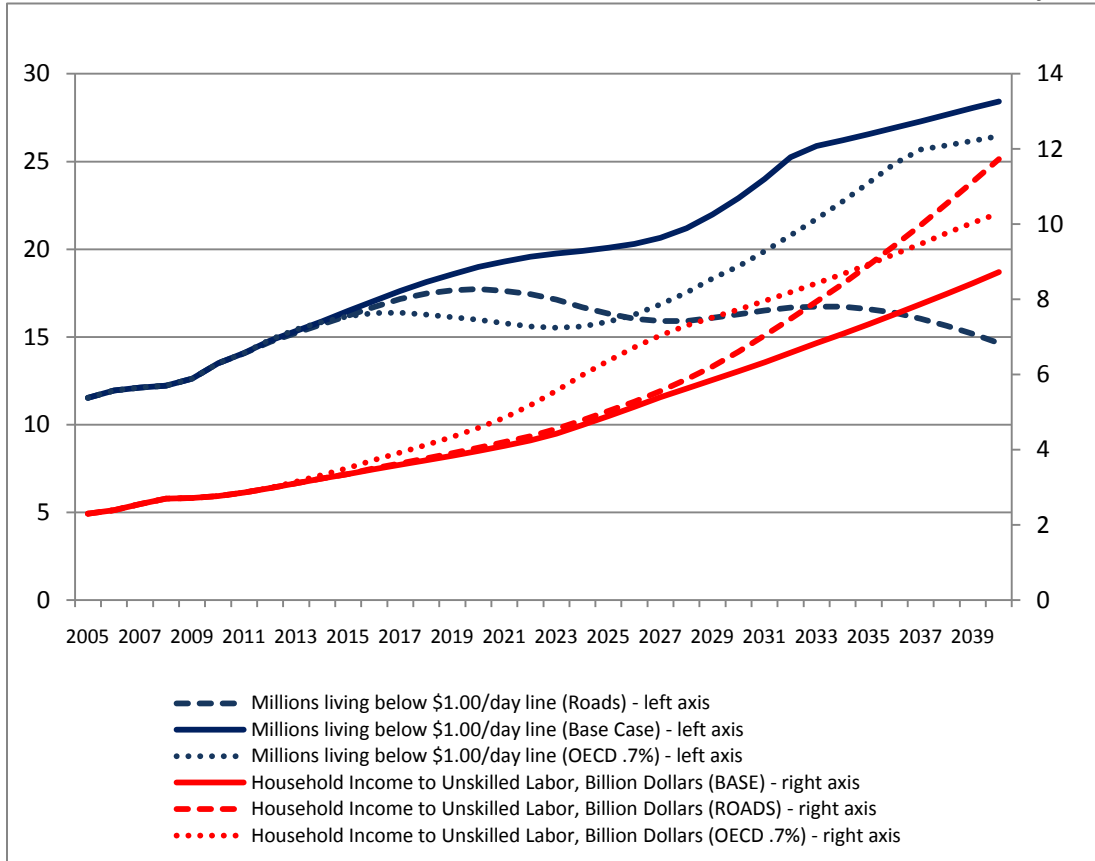
Source: IFs, version 6.36.

²⁸ There is absolutely no effect on multifactor productivity, agricultural productivity, GDP or poverty levels as a result. Though IFs “accepted” the intervention, indicating a higher density of roads between the base case and the working file, the road density multiplier is not connected to any other multiplier in IFs (including multifactor productivity), and thus showed no results.

²⁹ The specifics of this “brute force” intervention are as follows: Agricultural yield multiplier increases gradually from 1.0 to 1.2 from 2015 through 2025 (allowing a few years for road building, improvement and maintenance to “kick in”). After 2025, the 1.2 value agricultural yield multiplier is maintained through 2040, assuming that roads stay in good condition and are regularly maintained (an expenditure which again can be drawn from the ODA pot of money). The loss of agricultural production multiplier was reduced by half gradually beginning in 2015 through 2025, and maintained at 0.5 through 2040.

Increase in agricultural output as a result of much-needed improvements in rural road infrastructure serves a multifold purpose in Madagascar’s development trajectory, because as a proximate driver it will (intuitively, at least) lead to increases in income and economic levels for rural populations (and, therefore, reductions in poverty levels in comparison to the base case forecast). The IFs forecast data confirm these intuitions:

Interventions vs Base Case Forecast: Effect on Household income and Extreme Poverty Level



Source: International Futures, version 6.36.

Furthermore, we see from these forecasts that simply “throwing money” at Madagascar’s government and economy through an increase in ODA is not quite as effective as strategically using a portion of this money to increase a specific sector. In the case of the “Roads” intervention, utilizing only half of the new money that would come in from ODA to improve roads (and as a result, increase agricultural yield and reduce the loss of crops due to spoilage or rotting) provides significantly more positive results on unskilled (mostly rural) household income and overall poverty levels.

In terms of other human development indicators (of which increased agricultural yield is a more distal driver), applying an aggressive multiplier on agricultural yield will result in improvements above the base case in a number of areas, as well as in improvements above the non-sector-specific “OECD .7%” funds scenario. Below is a table comparing base case and intervention results for the year 2040 in all three scenarios discussed in this report:

	Base Case	OECD .7% Scenario	Roads Intervention
Human Development Index	.721	.732	.734
GDP per capita @ PPP (USD)	USD\$414	USD\$490	USD\$557
Child Malnutrition (Number of children)	1.337 million	1.192 million	1.053 million
Government Effectiveness (0-5)	2.119	2.143	2.144
Primary Education Completion Rate	81.83%	82.81%	82.67%
Urban Population (Millions of people)	15.15	15.02	15.29

Neither the “OECD .7%” scenario (on its own) nor the “Roads” intervention has the potential to eradicate extreme poverty in Madagascar before 2040, though each represents an improvement in the base case for all of the indicators. Even the stronger and more cost-effective intervention of the two – sector-specific investments into rural road infrastructure building and upkeep – cannot solve all of Madagascar’s many social, political and developmental ills. Nevertheless, the results of the hypothetical interventions proposed in this report are *not* insignificant and represent an aggressive yet reasonable attempt to curb poverty levels on the impoverished “Red Island.” Furthermore, the case for improving road infrastructure (beyond what has already been demonstrated in this report) is compelling. First, it does more than a simple injection of top-down capital into a corrupt, inefficient and unstable governmental structure (which has been characteristic of Madagascar’s own aid history). Numbers taken from current or recently implemented Malagasy development projects (on the high end, no less) suggest that using just half of the hypothetical “OECD .7%” funds through 2040 in order to build and maintain roads can lead to immense growth in agricultural yield and production as well as create more efficient rural markets. Finally, higher income and labor productivity generated from the primary sector may encourage those who would typically be pushed into an agricultural or rural job to seek education, employment and a new life in the city, contributing to the secondary and tertiary sectors of the Malagasy economy.

CONCLUSION

The Spectre of Unintended Consequences: “Red” at the Expense of “Green”?

The final step in this analysis is to examine the potential impact of unintended consequences of an intervention to heighten agricultural productivity, not only in terms of its purely ecological footprint but also in terms of its impact on Malagasy citizens’ livelihoods in the long term. Madagascar’s own agricultural history has demonstrated that unregulated and uninformed economic growth (especially in an agricultural-based economy that has traditionally favored unsustainable farming techniques) often comes at a severe environmental cost. An overemphasis on alleviating the “red” challenges facing the country (pressure to industrialize, to promote urban growth, to boost the agricultural sector, and to lift the maximum number of Malagasy from levels of extreme poverty) will come at the expense of much-needed “green” initiatives to protect the country’s fragile ecosystems and set the population on a path of sustainable economic, industrial and demographic growth. As the country continues to straddle these two paths, levels of education, participatory government and economic security will become ever more important.

The IFs model does not forecast significant changes in land use as a result of the “Roads” intervention: in fact the results indicate that in 2040 crop production will use 60,000 fewer hectares of arable land than

in the base case scenario (4.408 rather than 4.468 million hectares in the base case).³⁰ This forecast does not fall in line with historical data: over the last forty years, about 20 percent of the increase in Madagascar's agricultural production was achieved through intensification of the existing farm land (that is, by making the used land more productive), while the other 80 percent was achieved through land extensification (that is, by expanding farm land, often at the expense of forest cover). (Minten, Randrianarison and Swinnen 2006: 2) However, because the "Roads" scenario brings along with it significant improvements in household income (especially of unskilled workers), there is reason to believe that farmers benefiting from increase agricultural productivity will reinvest part of their earnings into acquiring the necessarily fertilizer, seeds, and technology to increase output from the land they already own.

The fact that the "Roads" scenario figures are lower than in the base case land use forecast offers good news, but is it a sufficient improvement to protect Madagascar's biodiversity and unique forest habitats? Unfortunately, the numbers do not seem to add up: assuming that in 2040 Madagascar's total land size will be the same as it is today (587,040 square kilometers³¹), dedicating 4.4 million hectares (or, equivalently, 44,000 square kilometers) to crop production would mean that nearly one-tenth of Madagascar's total land-size will be used for crops. Even more importantly, 4.4 million hectares is well above what the U.N. Food and Agricultural Organization says to be Madagascar's arable land: 2.95 million hectares, according to 2007 estimations.³² This *necessarily* means that increased land use as a result of the "Roads" intervention will come at the expense of forest cover, flora and fauna biodiversity, endangered species survival, climate change mitigation and (in all likelihood) overall future livelihood in Madagascar.

Is land protection the answer? In the past decade the governments of Ratsiraka, Ravalomanana, and Rajoelina have alternatively made sweeping announcements and promises to protect large tracts of forest from firewood collection, the commercial timber industry, and other types of unsustainable land use. (Interestingly enough, however, in 2008 the government of Madagascar under Marc Ravalomanana negotiated with South Korean corporation Daewoo Logistics a 99-year agreement to lease out about 3.2 million acres (1.3 million hectares) of Malagasy farmland – nearly half of Madagascar's total arable land. This deal (perhaps luckily) was later axed. (Walt, "The Breadbasket," 2008))

As in the late 1980s and 1990s when Integrated Conservation Development Projects (ICDPs) were first introduced to Madagascars, rural poor farmers have been identified as the main culprits in deforestation (and have become the primary victims of efforts to curb the trend). Depending on arable land for their livelihoods, agricultural subsistence-based communities uneducated in sustainable farming practices are often identified as the root cause of deforestation and associated degradation. The ICDPs, as a result, increased the number of protected areas on the island and saw environmental conservation grow. This was seen as a "win-win" for Madagascar, though it came at the expense of agricultural productivity and thus primary source of income for the country's rural poor. As Nadia Rabesahala Horning's doctoral research on the ground in five Madagascar communities indicated, increasing protected areas through ICDPs in the 1990s and early 2000s did not prove a direct correlation with improving rural livelihoods. In fact, and especially when ICDP conservation rules were imposed forcibly on demonized farmer communities, her results showed a negative impact. (Horning 2003: 20-22)

³⁰ International Futures, version 6.36.

³¹ International Futures, version 6.36.

³² See: <http://www.tradingeconomics.com/madagascar/arable-land-hectares-wb-data.html>.

Aligning Red and Green Takes Actions and Interventions from Everyone

Introducing a concept much akin to the notion of a poverty trap, Horning describes the vicious cycle between poverty, development and environmental degradation as a “spiral of environmental degradation.” (Horning 2003: 18) Madagascar has already fallen deeply into this complicated and vicious cycle: the nature of its rural, subsistence-based economy is such that rural farmers often need to resort to unsustainable land use practices due to lack of access to capital and technology. At the same time, its corrupt and ineffective government, which operates at the whim of global corporations, has continued to allow (if not outright condoned) high rates of deforestation and forest fragmentation. With a majority of Malagasy citizens stuck in a poverty trap, the island’s residents – those whose families, children and grandchildren stand to lose the most from environmental degradation – are neither educated nor wealthy enough to have the “luxury” of being concerned by environmental degradation. As for those who are, they either have the resources and “opportunity” to leave the country, or lack the political voice to make a difference. Finally, when efforts are actually made to protect the environment, they are either insincere or accomplished by excluding, demonizing and damaging the welfare of those citizens who can least afford it or defend themselves.

Unfortunately, solving Madagascar’s economic, social and political woes will not be achieved in one fell swoop. However, this fact should not deter the Malagasy population, its government, and the international community from taking steps to alleviate poverty for current and future generations. Providing capital and technical assistance to small-plot farmers to help “green” their land use and agricultural production could be an important first step; educating and working *with* (rather than against) rural farmers to implement environmental conservation projects might be an important second step; at an international level, fairer and more open trade practices would likely encourage “greener” practices and investments in Madagascar, according to some experts. (Minten, Randrianarison and Swinnen 2006: 11)

This scenario, however, is not something that a computer model can (or should) attempt to replicate: ultimately it will be in the hands of government officials, development professionals and Malagasy citizens themselves to put these crucial steps into action.

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