Prospects and Challenges:
Mozambique's Growth and Human Development Outlook to 2040

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FOREWORD

It is with great pleasure that the Embassy of Ireland in Mozambique, in collaboration with the Institute for Security Studies (ISS), presents this report on Mozambique's prospects and challenges in the years to 2040. While the study was initially conceived as an input into our thinking about our next country strategy – and will indeed be used as such – we believe it can have wider interest as a way to debate the policy choices that need to be made in order to secure the best future for Mozambique and its people.

Often development agencies – and national governments – get tied into 5 year planning cycles, and at times it is useful to step back and take a longer term perspective. This report does not aim to predict the future, but rather to frame the questions and assess the different options facing the country and its development partners in the years to come. We hope that this report is just a first step in incorporating longer term forecasting and analysis into the policy making arena. The Ministry of Economy and Finance has accompanied the process throughout, and ISS and the embassy stand ready to support the government in developing their understanding and use of the tools developed during this process.

What is clear is that while Mozambique faces some huge challenges in the years ahead, with the right choices and interventions, and support from the international community, Mozambique has the opportunity to improve the lives of many Mozambicans. The risks to achieving this should not be underestimated however, and as the report shows, the potential role of natural gas in particular should not be overstated. Development is not an automatic process, and Mozambique will need to make smart, informed choices. I hope that this report can contribute in some small way to the debate around these.

I would like to personally thank the ISS team for an excellent and thought provoking collaboration. I am also extremely grateful for the collaboration from the Ministry of Economy and Finance and in particular National Director Vasco Nhabinde and his team, and also other government officials from various ministries who participated in a number of thematic sessions and provided updated data. The work also benefitted from the exceptional insights of the embassy's "critical friends" from civil society and academia who provided comments and inputs and on whom we continue to depend for the next stage of the country strategy development. To the many colleagues within the donor community who brought their insights and experience to the workshops and who commented on the various drafts of the report, a big thank you. Finally, I would of course like to thank the whole Irish embassy team who provided excellent technical inputs and considered analysis throughout.

William Carlos
Ambassador of Ireland to Mozambique
June 2017

EXECUTIVE SUMMARY

Purpose and Scope

This report uses the International Futures (IFs) forecasting system to analyze and provide an overview of Mozambique's progress in a historical and regional context, show its expected trajectory across a number of core development sectors, and explore alternative futures through scenario analysis. It explores five-year alternative scenarios that simulate the successful implementation of various health, education, agricultural, and governance related programs between 2018 and 2022 and evaluates their long-term impact (out to 2040). It also includes two broader positive and negative possible trajectories in order to frame uncertainty around Mozambique's future.

In this sense, this report is meant to offer a framework in which to think about and evaluate long-term effects and tradeoffs of successful policy interventions across sectors, rather than to offer sector-specific policy and implementation guidance.

The report was financed by the Embassy of Ireland in Mozambique, as an input into the development of their Country Strategy 2018-22, and developed in collaboration with the National Directorate for Economic and Financial Studies of the Ministry of Economy and Finance. The process included updating the model with national data, consultations with national stakeholders in Maputo including government officials, civil society and international development partners, and a scenario workshop to explore the range of interventions in the model.

Overview

Mozambique has experienced significant progress across many areas of human development over the past 20 years. Economic growth has averaged 7%, life expectancy has improved by over 10 years, gross primary enrollment has increased by nearly 60% and agricultural production has increased by 50% over this period. While this progress has improved the lives of some Mozambicans, it has not translated into inclusive growth and development for much of the population.

Mozambique continues to lag behind its peers in key human and social development indicators. The number of people living in extreme poverty has risen by over 5 million since 1995, the number of those without access to improved water and sanitation has risen by nearly 4 million and more than 7 million, respectively, and Mozambique still has one of the lowest levels of educational attainment in the world.

The recent discovery of natural gas has generated great optimism for the country's future. However, natural gas production and ensuing GDP growth will not be a panacea for Mozambican development. Natural gas production is forecast to drive large gains in economic growth from the mid-2020s to the early 2030s, but rapid population growth, rising inequality and lack of access to basic services and infrastructure means that much of this growth may not benefit the poor. Even with a significant increase in gas production and growth, the absolute number of people living in extreme poverty is forecast to be nearly the same in 2040 (18.7 million) as it is today (19 million).

Without a concerted effort to invest in human development and improve government capabilities, it will be difficult for Mozambique to ensure long-term inclusive growth and development regardless of the outcome of natural gas production. Moreover, it is extremely important that Mozambique

improve its ability manage natural gas revenues to ensure that the windfalls benefit all Mozambicans.

Takeaways

Our analysis finds that a five-year push to improve various aspects of human development, governance, and agricultural production will help to put Mozambique on a path towards inclusive growth and development. More specifically, Mozambique, with the support of its development partners, should strive to:

- **Improve family planning and care.** Mozambique's young and rapidly growing population (estimated to reach 53 million by 2040) makes it difficult to provide access to quality basic services for much of the population. Improving family planning (and child and maternal care) will help to reduce this strain.
- **Extend health services and nutrition.** Mozambique has a large communicable disease burden, especially in infants and children under five. Extending health infrastructure, increasing food availability, improving antiretroviral access, and extending malaria testing and prevention services will help reduce this burden.
- **Advance education.** Mozambique has the second lowest primary survival rate in the world – only 40% of the students who enter primary school make it to the final grade. Improving survival rates and graduation rates will increase attainment across all educational levels.
- **Boost agricultural production.** Given the importance of the agricultural sector in both sustaining livelihoods of the poor and vulnerable and improving food security, increasing domestic production will have positive long-term effects on poverty and food import dependence.
- **Strengthen governance.** Mozambique will need to improve its ability to manage gas revenues and invest in basic services for its rapidly growing population.

Interventions in each of these areas have strong positive effects within each individual sector, but they also have important effects across broad development indicators. Boosting agricultural production, improving family planning, and strengthening governance have the largest positive effects on extreme poverty. Meanwhile, strengthening governance has the biggest impact on overall economic output and advancing education has the largest impact on the Human Development Index (HDI).

While each of these sectoral interventions address an important facet of Mozambique's development, a broad effort to improve outcomes across all these sectors will help set the country on a track toward inclusive growth and development. An integrated development push across all the above sectors results in a 14% increase in GDP, a 17% increase in government revenue, a 15% reduction in infant mortality, and a 23% reduction in people living in extreme poverty compared to the current trajectory.

However, delayed gas production, reductions in government effectiveness and limited progress across development sectors could result in stalled development and have huge impacts on the most vulnerable Mozambicans. A stalled development scenario results in a 24% reduction in GDP, 31% reduction in government revenue, an 18% increase in infant mortality, and over a 60% increase in the number of people living in extreme poverty relative the country's current trajectory.

AFRICAN FUTURES PROJECT (AFP)

The African Futures Project is an in-depth, multi-method research endeavor designed to map out potential future paths for different African countries and regions. It is the product of a partnership between the Institute for Security Studies (ISS) and Frederick S Pardee Center for International Futures at the University of Denver (Pardee Center).

ISS (www.issafrica.org) is an African organization with a substantial legacy of policy work on human security, peace, and development across the continent with its head office in Pretoria, South Africa. The Institute has regional offices in Addis Ababa, Ethiopia, Nairobi, Kenya and Dakar, Senegal.

The Pardee Center (pardee.du.edu) at the University of Denver brings decades of quantitative modeling expertise through their IFs platform, which integrates trend data across many development sectors.

The partnership between ISS and the Pardee Center represents a unique set of research capabilities and data expertise within the African context that can be leveraged to produce critical, data-driven, and forward-looking analysis.

INTERNATIONAL FUTURES (IFs)

IFs is a tool for thinking about development over long time horizons and is hosted and developed by the Pardee Center. IFs integrates forecasts across different sub-models, including: agriculture, demographic, economy, education, energy, environment, governance, health, infrastructure, international politics, and technology. These sub-models are dynamically connected, so IFs simulates how changes in one system lead to changes across all other systems. As a result, IFs endogenizes a large number of relationships from a wide range of key global systems. The model is open source tool and available for free at www.pardee.du.edu.

IFs leverages historical data (over 3 500 historical series), identifies and measures trends, and models dynamic relationships to forecast hundreds of variables for 186 countries for every year. Where available historical data is from 1960 and forecasts extend from 2014 (the current base year) to 2100. It provides forward-looking, policy-relevant material that frames uncertainty around the future of countries (or groups of countries) and across development systems. It thereby allows users to think systematically about potential futures, as well as development goals and targets.

There are three main avenues for analysis in IFs: historical data analysis (cross-sectional and longitudinal), Current Path analysis (where systems seem to be developing), and alternative scenario development (exploring if-then statements about the future). This report uses all three types of analysis.

IFs forecasts are informed extensions of current trends and dynamics built upon our current knowledge of development patterns and are not attempts to predict the future. The IFs platform is designed to help people think more carefully about how development systems work and how policy interventions are likely to unfold, rather than as a predictive exercise.

CURRENT PATH

The IFs Current Path is a dynamic forecast, within and across key development systems, that represents a continuation of current policy choices and environmental conditions. Although the Current Path generally demonstrates continuity with historical patterns, it generates a wide range of non-linear, dynamic, and endogenous forecasts rather than simple extrapolations of historical trends. The Current Path assumes no major paradigm shifts, seismic policy changes, or transformative 'black swans' (very low probability but high impact events). Given that the Current Path is built from initial conditions of historical variables and is calibrated against other forecasts, it is a good starting point to carry out scenario analysis and construct alternative future scenarios.

Because IFs spans 186 countries and uses international data sources, the Current Path for a specific project is often adjusted to better reflect current conditions and trends in that country. A number of adjustments were made to the Current Path after consultations with issue area experts and stakeholders in Maputo and further research into forecasts for Mozambique (see Annex).

PROCESS AND CONSULTATION

This report has benefited deeply from engagement with Irish Aid, their partners in Mozambique and the focal points from Ministry of Economy and Finance. As part of the consultation process, our team of researchers travelled to Maputo twice (3-5 April and 15-17 May) with the aim of identifying alternative sources for outdated data, adapting the Current Path to reflect the expectations of stakeholders and in-country issue area experts, and developing a set of alternative scenarios in support of Ireland's 2018-22 Country Strategy for Mozambique.

During the first trip, the team presented the findings from the initial Development Trends Report, outlining the initial Current Path and Irish Aid staff and partners provided alternative sources for out of date data series that were not available through major international providers. In addition, issue area experts from Irish Aid, other international development partners, think tanks, and NGOs provided valuable feedback on the Current Path forecast.

The second trip focused on presenting and workshopping various five-year alternative scenarios across development sectors and bringing them into line with Irish Aid's development priorities. It also served to help validate the Current Path adjustments made in light of the first consultation.

During both trips, representatives from Irish Aid and our team met with the Government of Mozambique's Ministry of Economy and Finance to present the project and to discuss opportunities for future engagement. We see this report as a way to show the power of this type of modelling and thinking, and as a first step toward building capacity on the model and, eventually, training and embedding it as a tool for long-term forecasting in the Ministry of Economy and Finance.

The final presentation and release of the report (in English and Portuguese) will take place in Maputo on June 28th, 2017.

1. INTRODUCTION

Mozambique is and has been in a state of chronic under development. Over 65% of the population (19 million people) lives in extreme poverty (less than US$1.90 per day) and most of the country lacks access to basic infrastructure (water, sanitation and electricity). The country has one of the lowest life expectancies in the world (ranked 173 out 186), suffers from a large communicable disease burden with persistently high AIDS death rates, and has the third lowest educational attainment in the world.

Over the past 20 years, Mozambique has registered about 7% average annual GDP growth and has made progress across various development indicators. Since 1995, the country has increased life expectancy by 10 years, increased primary school enrollment (gross) from 66% to 105% and has improved agricultural yields by 50%. Despite these achievements, the country still lags far behind global and regional peers (Malawi, Tanzania, Zambia and Zimbabwe)[1] in nearly every aspect of human development.

Mozambique's economic growth and development has been unable to keep pace with population growth. Over the past 20 years, the number of those living in extreme poverty has risen by 5 million and the number of those without access to improved water and sanitation has increased by 3.8 million and 7.3 million, respectively. IFs forecast that Mozambique's population will continue to grow at a rapid pace, which will make it more challenging for the Government of Mozambique (GoM) to extend basic services.

The recent discovery that Mozambique holds one of the largest reserves of natural gas in the world provides optimism for the country's future. If the GoM can successfully manage the extraction and investment of gas revenues, it could turn a somewhat pessimistic outlook into a virtuous cycle of growth and development. Unfortunately, turning resource revenues into development is notoriously difficult, and the recent debt crisis has undermined confidence that Mozambique can escape the 'resource curse' and transparently manage gas revenues for the benefit of all Mozambicans.[2]

2. NATURAL GAS, GROWTH AND POVERTY

The discovery of one of the world's largest concentrations of natural gas has moved the energy sector to the forefront of Mozambique's growth and development plans. Revenues from the export of natural gas could provide a major boost to the government's fiscal balance and, if invested back into the country, could help improve basic human development outcomes and start Mozambique on a path towards sustainable development.

However, growth from natural resource extraction often doesn't translate into improved development outcomes for the poor and vulnerable.[3]

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[1] This regional grouping is based on a combination regional, economic, and size (both population and land area) considerations.

[2] Boats and a scandal: Mozambique's default. The Economist. 19 January 2017. http://www.economist.com/news/middle-east-and-africa/21715030-mozambique-fails-pay-its-debts

[3] M. Humphreys and M. Sandbu. *The Political Economy of Natural Resource Funds*. Chapter 8 in Escaping the Resource Curse. Columbia University Press. 2007.

Along the Current Path, the massive boost in growth from natural gas production does little to reduce absolute poverty over the next 23 years, while gains in other development sectors (i.e. education, health) only accelerate in the 2030s. Further, large energy windfalls can disincentivise improvements in government effectiveness and transparency.

In other words, natural gas production is not a silver bullet for development in Mozambique. Ensuring that gas production and growth translates into improvements in education and health outcomes and reductions in poverty will require careful management and investment back into key human development sectors.

2.1 Natural Gas Current Path

As of 2015, the International Energy Association (IEA) estimated that Mozambique has 2.8 trillion cubic meters in natural gas reserves, most of which are in the north of the country. Recent discoveries have pushed that total reserve number to 3 trillion cubic meters.[4]

Mozambique is already producing and exporting energy from a few smaller natural gas pockets (Pande and Temande fields) in the south of the country.[5] However, optimism around natural gas production and growth revolves around the timeline of construction and production for the larger deposits in the Rovuma basin area (Areas 1 and 4).[6] The amount of recoverable natural gas in these areas is greater than the total gas reserves in Nigeria; planned peak production from the Rovuma basin would make Mozambique the third largest exporter of liquefied natural gas (LNG) in the world.[7]

The most recent review of natural gas plans from the International Monetary Fund (IMF) projects that gas production in Areas 1 and 4 could start in 2021 (one Floating Liquid Natural Gas (FLNG) and two onshore trains), with construction and production increasing fairly rapidly as the rest of the planned FLNG and onshore trains come online between 2021 and 2028.[8] However, uncertainty surrounding the sovereign debt crisis and delays in final investment decisions (FIDs) have thrown this timeline into flux.

Based on consultation with economists and gas experts in Mozambique and research on best estimates of construction and production, the Current Path forecast has been adjusted to reflect

[4] This translates into approximately 19 billion barrels of oil equivalent (BBOE) in total recoverable reserves to date. It is likely that more reserves will be found as exploration increases - standard estimating models suggest that there could be an additional 3 trillion cubic meters of recoverable natural gas. (The future of Natural Gas in Mozambique: Towards a Gas Master Plan - Executive Summary. ICF International. 20 December 2012)

[5] Operated by Sasol.

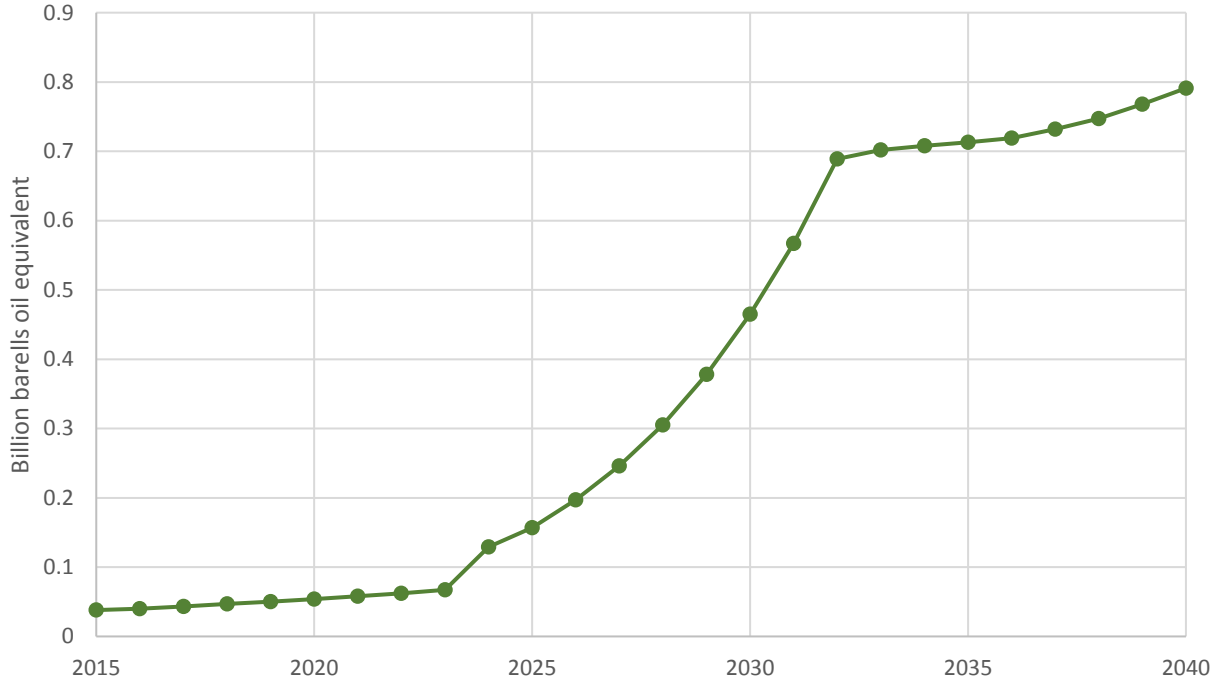
[6] The initial plan was to start liquid natural gas (LNG) production in the Rovuma basin from 2020 and ramp up production to the full four trains by 2023. In 2020, the first train would produce 5 million tons (36 million BOE) and production would be ramped up to 20 million tons (146 million BOE by 2023). But the recent sovereign debt default and ongoing negotiations with gas companies have thrown that timeline into flux. (G. Melina and Y. Xiong. Natural Gas, Public Investment and Debt Sustainability in Mozambique. IMF working paper. November 2013)

[7] Republic of Mozambique - Selected Issues. IMF. January 2016.

[8] The total capacity of production starting in 2021 (from the two onshore trains and floating train) would be around 14 million tons of LNG per year. The IMF expects that a total of 13 onshore trains and 4 floating trains will be built for the gas project in the Rovuma basin (both areas) by 2028. (Republic of Mozambique - Selected Issues. IMF. January 2016.)

updated expectations of the magnitude and timing of gas production. Initial FLNG and onshore production are forecast to come online in 2023 and 2024, respectively, (rather than 2021) and ensuing construction and production of additional trains are expected to be completed over the following 8 years (to 2033). The Current Path forecasts that Mozambique will produce 53 million barrels of oil equivalent (BOE) (6.3 million metric tons) by 2020, 460 million BOE (55 million metric tons) by 2030 and 790 million BOE (97 million metric tons) by 2040.

Figure 1: Natural gas energy production, Mozambique, forecast



Source: IFs version 7.28; historical data from the International Energy Agency (IEA) and the U.S. Energy Information Association (EIA)

The timeline for gas production is inherently uncertain and the impact of delays will be explored later in this report. However, whether or not gas production comes online exactly as forecast in the Current Path, exploring the impacts of this type of rapid production and growth from gas is extremely important for the future of Mozambique.

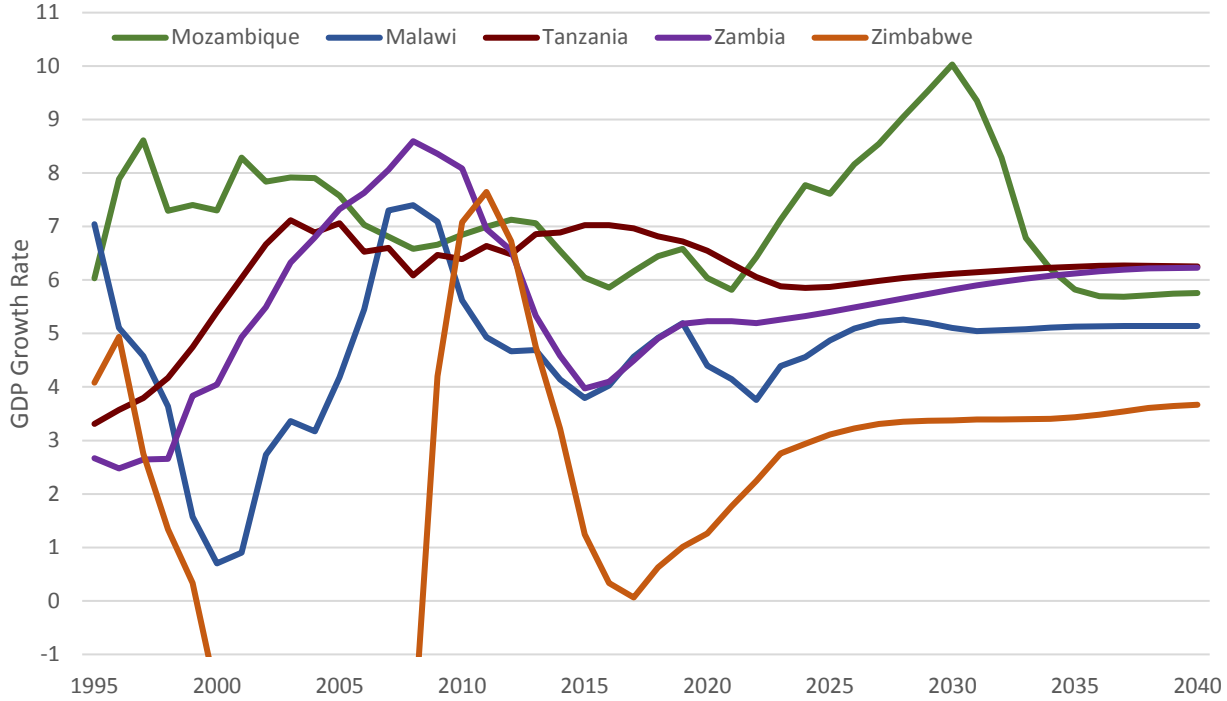
2.2 Growth

Since 1995, Mozambique has averaged about 7% GDP growth, which is 2 percentage points higher than the average for low-income African countries over the same time period. It is also higher than any of its regional peers. Tanzania registered the second highest average annual growth rate over that time period (6%), while Zimbabwe registered the lowest (0.16%).

In 2016, Mozambique's growth rates dropped to 3.3%, in part due to the unexpected sovereign default after previously unknown government-backed debt came to light. The IMF and World Bank have downgraded Mozambique's near-term growth outlook, but the country is still forecast to rebound to around 6.5% growth by 2018.

IFs forecasts that Mozambique will average 9.3% growth between 2024 and 2033 (coinciding with rapid increases in gas production) and will average 7.1% per year over the 23 year time horizon.

Figure 2: GDP growth rates (five-year moving average), Mozambique and regional peers, history and forecast (1990-2040)



Source: IFs version 7.28, historical data from IMF

The Mozambican economy is currently comprised primarily of low value added services and subsistence agricultural production. Service output as a share of GDP stands at about 45%, while manufacturing value added is just under 14% and agricultural value added accounts for about 20%. The energy sector already plays a significant role in the Mozambican economy representing about 13% GDP. If gas production develops in line with Current Path forecasts, the energy sector is likely to be a major contributor to value added in the Mozambican economy and become the primary driver of economic growth in the country from the mid-2020s to the mid-2030s.

The key question is whether rapid growth and shift to an energy-intensive economy will foster inclusive development. If past experiences with natural resource extraction in developing countries is any indication, the link between resource-led growth and inclusive development is weak.[9] As growth in the economy becomes more concentrated in extractive industries (i.e. more capital intensive), gains are more likely to accrue more rapidly to investors and those with high-level skills.

In this sense, the agricultural sector will remain important for poverty reduction. Over 70% of the Mozambican population is employed in the agricultural sector and increasing agricultural production and income will likely have the most immediate impact on poverty reduction. Meanwhile, a concerted effort to invest in human capital development by improving access to basic services (i.e. education, health, sanitation) will be necessary to ensure long-term human development and poverty reduction.

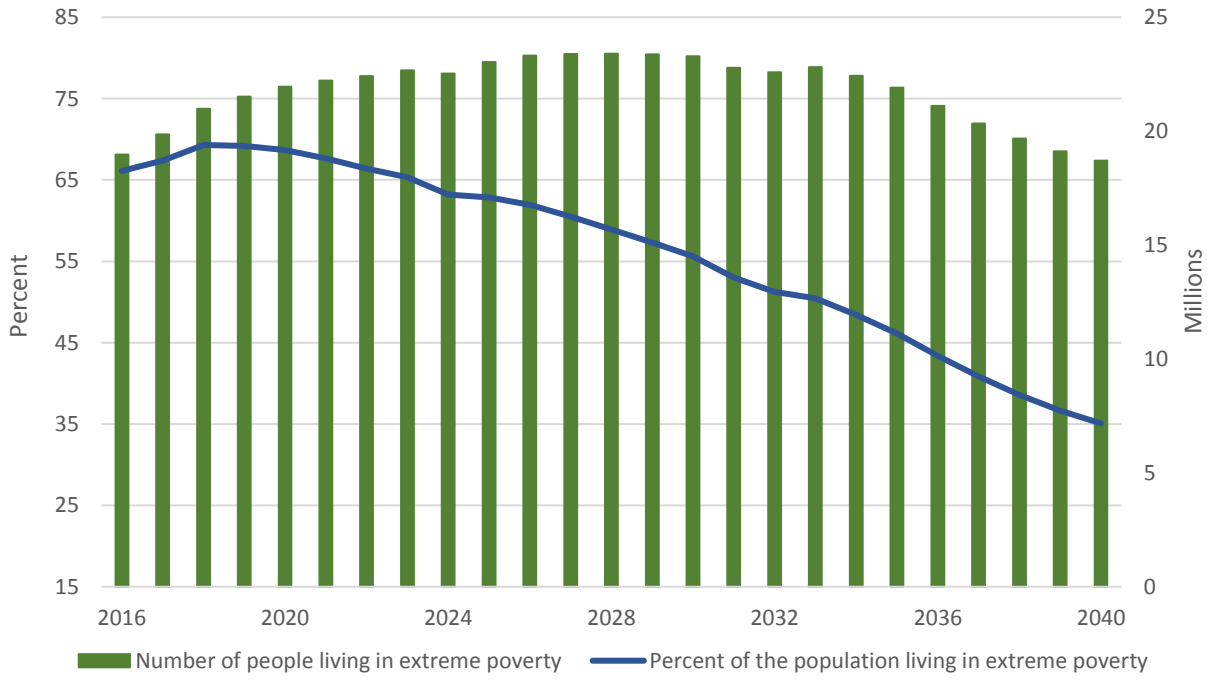
[9] Barma, N., et al. (2012). Rents to riches?: The political economy of natural resource-led development. World Bank.

2.3 Poverty

Since the end of the civil war, Mozambique has struggled to ensure that growth and development reaches the poorest and most vulnerable. Even though Mozambique has registered around 7% growth over the last 20 years, the number of those living in extreme poverty (less than US$1.90 per person per day) has increased by 35% (5 million individuals).

Currently, the portion of the population living in extreme poverty in Mozambique stands at about 66% (19 million people), which is on the high end of its regional peer group. The Current Path forecasts that this will drop to about 35% by 2040, but there will still be nearly 19 million people in extreme poverty in Mozambique. In other words, despite high economic growth, the absolute number of those in extreme poverty is forecast to remain relatively unchanged between now and 2040.

Figure 3: Extreme poverty (millions and percent of population), Mozambique, forecast



Source: IFs version 7.28, historical data from World Bank World Development Indicators (WDI)

Mozambique's historical and continuing burden of poverty is largely a function of its population growth rates, lagging improvements in basic human development, and increasing inequality. Mozambique's Gini coefficient (measure of income inequality in society, where higher values represent greater inequality) stands at about .47 (the highest in the world is South Africa at .63). IFs forecasts this inequality to accelerate rapidly as gas production increases from the mid 2020 to the early 2030s.

Meanwhile, low access to basic human services means that poor and vulnerable individuals lack a basic foundation necessary to improve their condition. Mozambique ranks 183 out of 186 globally on HDI,[10] below countries with significant internal strife such as South Sudan, the Democratic Republic of Congo (DRC), and Burundi. Mozambique's HDI score is almost 30% lower than the average of its regional peers.

Lastly, Mozambique's young and rapidly growing population means that it will be increasingly difficult to extend access to basic human services in the coming decades.

[10] The Human Development Index (HDI) uses gross national income (GNI) per capita, mean years of education, expected years of education, and life expectancy to provide a broad indicator of the level of human development in a given country.

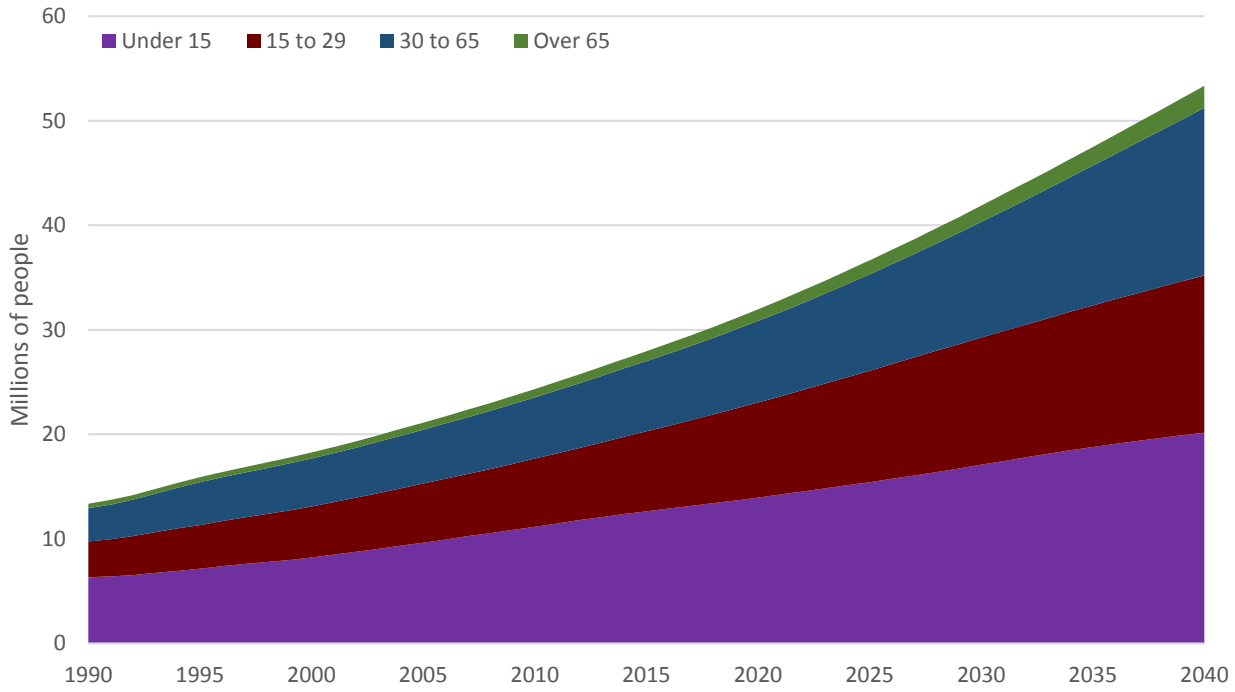
3. IMPROVING BASIC HUMAN DEVELOPMENT

Regardless of the outcome of natural gas production and management, Mozambique's path to inclusive growth and sustainable development is through improvements in human capital. The following sections describe the current state and Current Path of human development in Mozambique, lay out some of the specific challenges associated across demographics, health, education, and agriculture, and outline interventions and analyzes outcomes in each of these areas.

3.1 Demographics

Mozambique has nearly 29 million people, making it the 12th largest population in Africa and the 2nd largest in the southern African region. Population growth averaged 3% per year since 1992 and the country has added over 15 million people over the last 23 years. IFs forecasts that population growth will average about 2.5% per year out to 2040, which means that Mozambique will add an additional 24 million people over the next 23 years. By 2040, Mozambique is forecast to have 53 million people, which would make it the 10th most populous country in Africa.

Figure 4: Population by cohorts, Mozambique, history and forecast (1990-2040)



Source: IFs version 7.28, historical data from UN population division (UNPD)

Nearly 45% of the population is aged 15 or under (nearly 13 million people), which means that the country has a relatively high dependency ratio (ratio of elderly and youth to working age population).[11] By 2040, the population is forecast to still be amongst the most youthful populations globally; IFs forecasts that 38% of the population will still be under the age of 15. The country's dependency ratio is expected to fall (from nearly 1 to 1 now to 0.7 to 1 by 2040) as the population

[11] A high dependency ratio means that relatively few economically active individuals (working-aged) must provide for a relatively large economically dependent population (children and the elderly).

ages, but it will still be high by African and world standards (16th highest in Africa; 37th in the world).[12]

This youthfulness means that a relatively small portion of the population (working-aged) must provide for the basic needs of a large segment of the population. Moreover, rapid population growth and high dependency puts a massive strain on the government's ability to provide basic services, such as the provision of water and sanitation, to the population.

Mozambique's growing Youth Bulge

Mozambique is the only country in the region with a large and growing youth bulge (percent of the population aged 15 to 29). Mozambique currently has the 4th largest youth bulge of its regional peers (and the 13th largest in Africa), but by 2021 it is forecast to have the largest youth bulge in the region and the 7th highest in Africa. A large youth bulge can be a major driver of internal instability, especially if there is persistent unemployment, social and political exclusion, and a lack of service delivery for this segment of the population.[13]

While the ratio of dependents to working aged individuals may be declining, the absolute number of individuals under 15 is expected to rise to 20 million by 2040 (up from 12.8 million in 2016). This means that the government will need to provide health services and education for over 7 million additional young people in 2040. Along the Current Path, IFs forecasts that there will be over 6.3 million more children in need of education services, 3.4 million more people in need of improved sanitation facilities and 5.6 million more people in need of safe water access (See Figure 5 below).

Figure 5: Population in need of basic health, education, infrastructure services (millions), Mozambique (2016, 2022 and 2040)

	2016	2022	2040
Primary and Secondary Aged Children	12.4	14.1	18.7
Population Without Piped Water	26	28.8	31.6
Population Without Improved Sanitation	22.5	24.7	25.9
Population Without Electricity	21.9	25.3	34.3
Population Living in Extreme Poverty	19	22.4	18.7
Population Living in Poverty	23.5	27.5	26.8

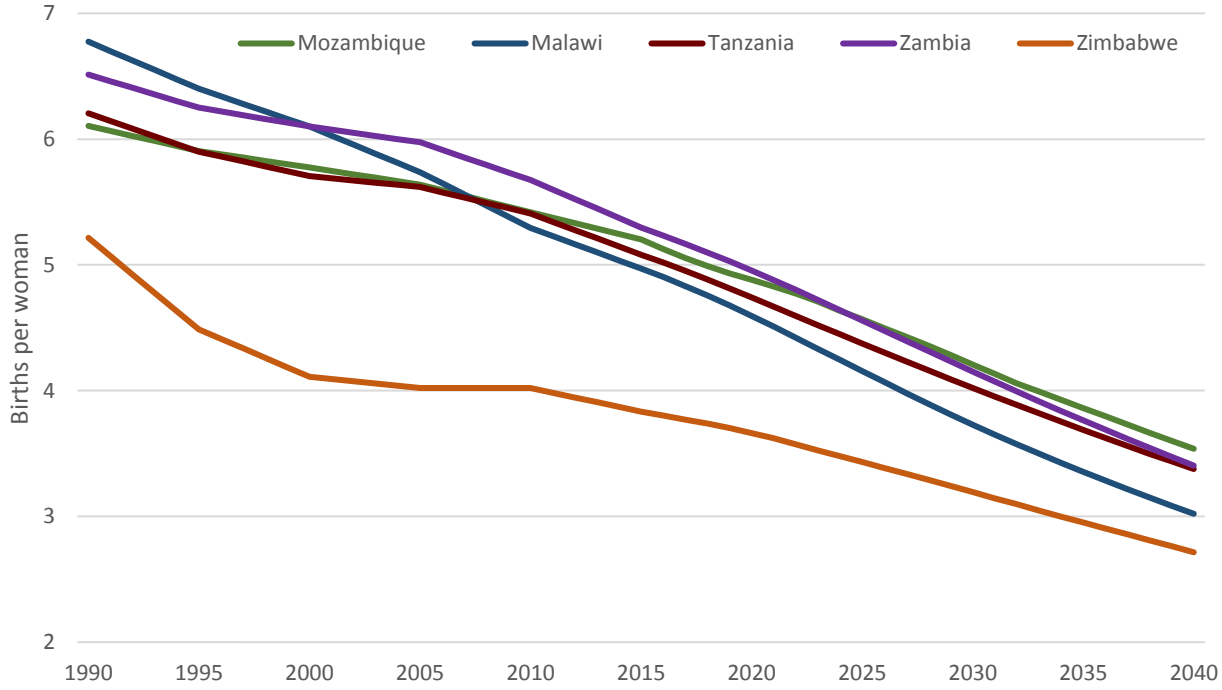
Source: IFs version 7.28, historical data from UNESCO Institute for Statistics (UIS), UN Joint Monitoring Program on Water Supply and Sanitation (JMPWSS), WDI, World Health Organization (WHO) and UNPD.
Note: Red indicates an increased number of people in need of access and green indicates a decreased number.

[12] Note that high dependency ratios in the developed world manifest as a higher ratio of over-65 individuals rather than under-15.
[13] Hendrik Urdal, The Devil in the Demographics: The Effect of Youth Bulges on Domestic Armed Conflict, 1950-2000, Social Development Papers, Paper no 14, June 2004, pp 2 and 4.

Barring a major migratory event,[14] the core drivers of population growth are increases or decreases in fertility rates and life expectancy. Though Mozambique has significantly improved life expectancy since 1990, it still has a lower life expectancy than would be expected based on its level of development. At 57.6 years, it has the lowest life expectancy in its regional peer group and ranks 41st in Africa.[15] Further, Mozambique's gains in life expectancy have progressed much more slowly than regional peers over the last 15 years.

Mozambique has registered significant decreases in fertility over the past 15 years, but fertility rates are still higher than would be expected based on the country's level of development.[16] Fertility rate reductions have lagged behind regional peers and remain stubbornly high. In 2016 Mozambique's fertility rate was 5.1 births per fertile woman, which is the 13th highest rate in Africa.

Figure 6: Fertility rates, Mozambique and regional peers, history and forecast (1980-2040)



Source: IFs version 7.28, historical data from UNPD

Among the reasons for continued high fertility in Mozambique are low contraceptive use, high infant mortality rates, and low female educational attainment. At only 13%, female contraception use in Mozambique currently ranks last in regional peer group and is forecast to continue to lag behind out to 2040. Furthermore, only 22% of the adult female population has completed primary school (also the lowest completion rate among regional peers). Lastly, Mozambique's infant mortality is the highest in the region (at 56 deaths per 1 000 live births). Improving educational outcomes, reducing gender inequality, raising incomes, and extending mother and child care could play a major role in reducing fertility rates.

[14] The Mozambican civil war cause a massive out-migration between the late 1970s and early 1990s and subsequent in-migration through the mid-1990s. This migratory event had large impacts on the population growth rate over those two decades.
[15] Causes of this relatively low life expectancy are explored further in the health section of this report.
[16] As measured by GDP per capita.

3.2 Scenario Analysis: Improving Family Planning and Care

Given the service delivery challenges posed by Mozambique's large and growing population, slowing rapid population growth could help ease pressures on both the government and working-aged individuals to provide basic goods and services. In this section, we explore the effects of an Improved Family Planning and Care scenario on Mozambique's demographic trajectory. This scenario simulates a five-year policy push to improve family planning and child and maternal care outcomes (see Figure 7 for details).

Figure 7: Improving Family Planning and Care interventions

Intervention	Description
Family Planning	Reduces total births per woman from 5 to 4.7 between 2017 and 2022. Malawi and Botswana have achieved similar total fertility rate reductions in the past.
Increased Contraception use	Increases contraceptive use from 14% to 22% between 2017 and 2022. Malawi has achieved similar increases in contraceptive use.
Maternal mortality	Reduces the number of communicable disease deaths for adult women by 19% between 2017 and 2022. Botswana achieved an even greater increase between 2000 and 2005.
Under 5 mortality	Reduces under 5 communicable disease mortality from 14.3% in 2017 to 10.3% in 2022.

The Improving Family Planning and Care scenario reduces infant mortality by 8% and increases female contraception by 16% compared to the Current Path in 2040. These improvements, along with improvements in family planning, combine to reduce total fertility by over 12% compared to the Current Path by 2040. This reduction results in a 4% reduction in total population (2 million fewer people) by 2040.

As a result of the population reduction, GDP per capita increases by 2.5% compared to the Current Path by 2040. Mozambique also records a slight decrease in its youth bulge and the dependency ratio falls by 8% relative to the Current Path in 2040.

The Improving Family Planning and Care scenario also reduces extreme poverty by 8% by 2040 (compared to the Current Path). This means that just over 17 million people instead of nearly 19 million will be living in extreme poverty by 2040. Further, one million fewer people will need access to improved sanitation and over 1.5 million fewer people will need access to piped water by 2040, relative to the Current Path (See Figure 8 below).

Figure 8: Population in need of basic health and infrastructure services (millions), Mozambique, 2040

	Current Path	Improved Family Planning and Care
	2040	2040
Population Without Piped Water	31.6	29.9
Population Without Improved Sanitation	25.6	24.6
Population Living in Extreme Poverty	18.7	17.2
Population Living in Poverty	26.8	24.9
Undernourished Population	4.6	4.4
Undernourished Children	0.5	0.47

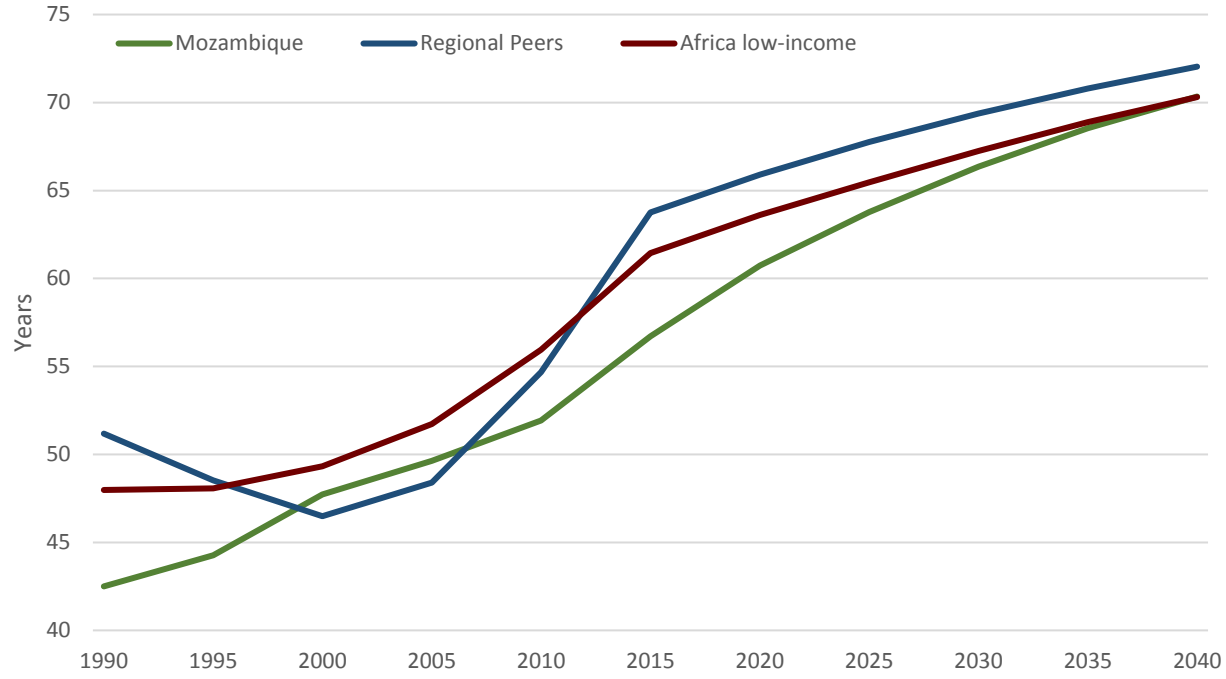
Source: IFs version 7.28, historical data from UN JMPWSS, UNPD and WDI

Slowing population growth may not be a development strategy in and of itself, but improving family planning and child and maternal care will help reduce the strain on the government and working-age population to provide for a young and growing population. Further, the resulting reduction in number the of people in need of health infrastructure and services (i.e. WASH) means that Mozambique will be better placed to reduce its heavy communicable disease burden.

3.3 Health

Two key indicators of the efficacy of a country's health system are life expectancy and infant mortality. At only 57.6 years, Mozambique's life expectancy is 4.5 years lower than the average low-income African country and 5.5 years lower than the average of its regional peers. IFs forecasts that life expectancy will improve over the time horizon, but will still be just below the low-income African average by 2040.

Figure 9: Life expectancy, Mozambique, regional peers and low-income Africa, history and forecast (2000 to 2040)



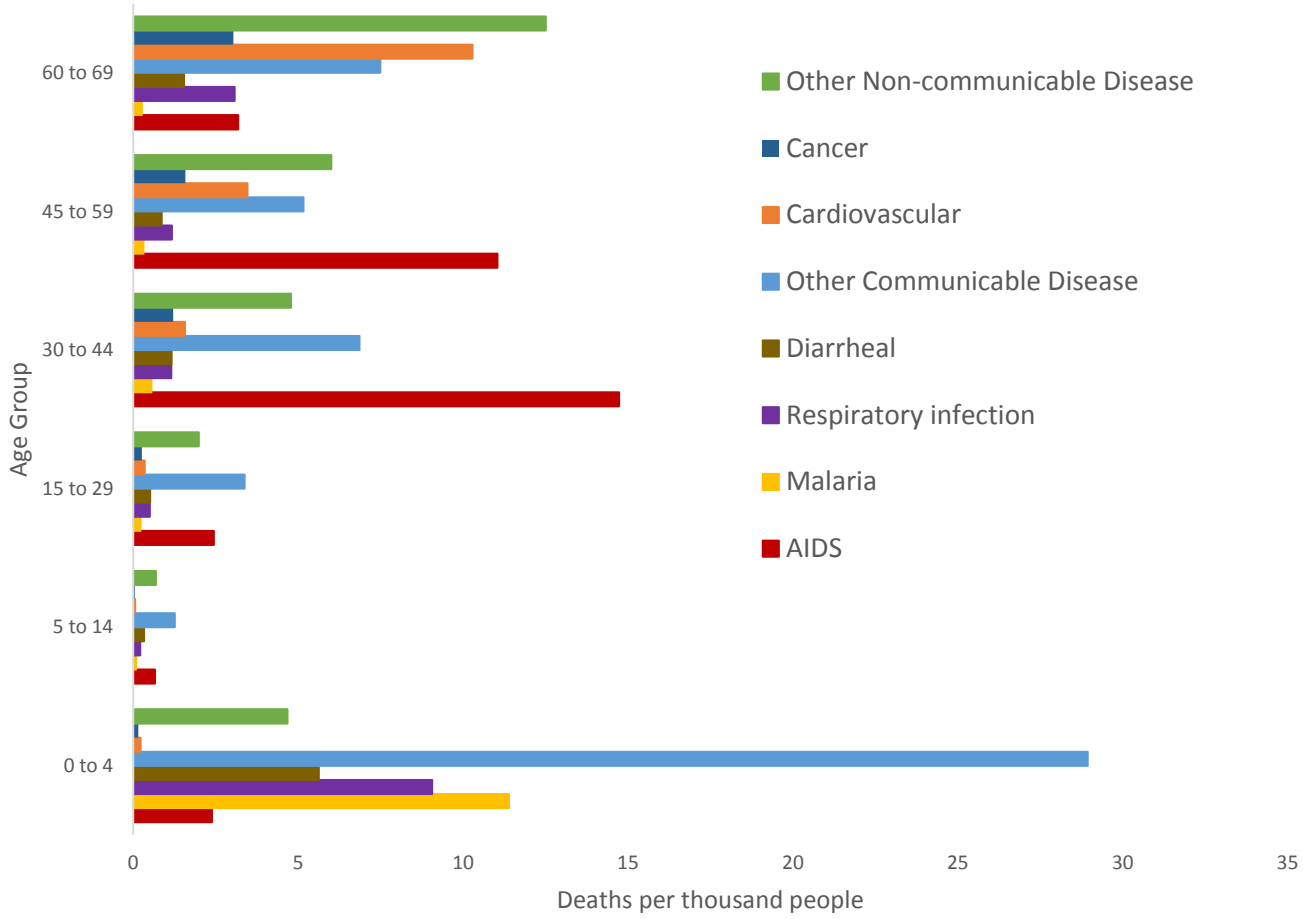
Source: IFs version 7.28, historical data from UNPD

Mozambique also has a relatively high level of infant mortality. The country has made significant progress in decreasing infant mortality over the past 25 years, but it started at a significantly higher rate than many of its peers (138 deaths per thousand live births in 1990). At 59 deaths per 1 000 live births (in 2015), Mozambique has the highest infant mortality rate of its regional peers and currently ranks 19th (out of 54) in Africa. IFs forecasts that Mozambique will reduce infant mortality at a fairly rapid pace, reaching 20 deaths per 1 000 live births by 2040.

The combination of low life expectancy and high infant (and under-5) mortality is often a result of high levels of communicable disease prevalence. Mozambique's communicable disease death rate stands at about 6.8 per thousand, which is 24% higher than the average low-income African country (5.5 per thousand) and 51% higher than the average of its regional peers (4.5 per thousand).

The cohort death rate distribution (below) shows that most premature deaths in Mozambique occur in the early stages of life and are heavily skewed toward communicable disease. However, even in the working age groups, communicable disease deaths dominate. AIDS is by far the largest burden in both the 30 to 44 and 45 to 59 age cohorts. In the older age cohort (60-69), the disease burden shifts to non-communicable diseases, such as cardiovascular disease and cancers.

Figure 10: Death rates by cohort, Mozambique, 2016



Source: IFs version 7.28, historical data from WHO

Much of the communicable disease burden for the under-5 and infant population is the result of a lack of health infrastructure. Use of traditional fuel sources (i.e. coal, dung) is a core driver of childhood pneumonia and other respiratory infections. Lack of health facilities for malaria testing and treatments and low bed net use contributes to Mozambique's high malaria burden.[17] Meanwhile, poor water and sanitation access is a core driver of communicable disease deaths (such as diarrhea) for children under 5.

This high communicable disease prevalence in under-5 children can also lead to undernourishment and stunting. Mozambique has one of the highest rates of childhood malnutrition in the region: more than 15% of children under 5 (750 000 children) suffer from undernourishment.[18] Due to high levels of childhood undernourishment, Mozambique also has high levels of stunting. At 31%, Mozambique's stunting rate (as a percent of the population) is the highest of its regional peers. Stunted individuals often have physical or cognitive impairments that can limit their ability to progress through school and/or limit their ability to work. The country also ranks in the bottom third of Africa in total undernourishment (as a percent of the population); about

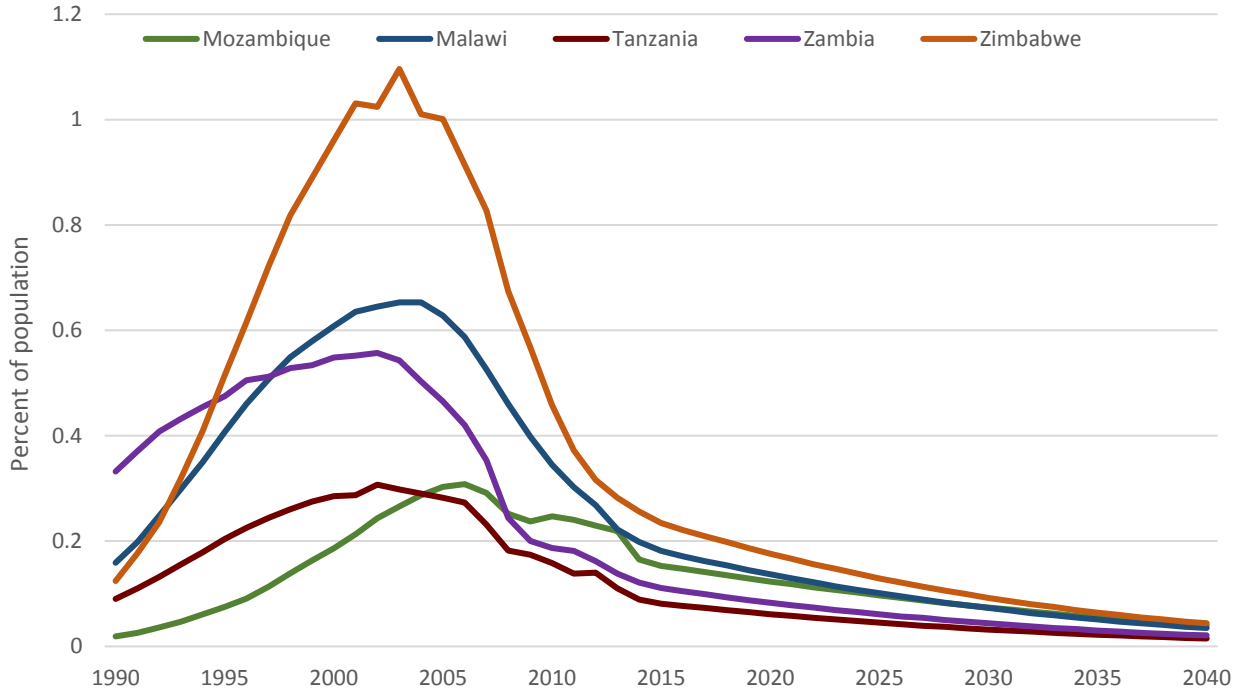
[17] Mozambique Situational analysis - Malaria, WHO country profiles. http://www.afro.who.int/index.php?option=com_content&view=article&id=3136&Itemid=2867

[18] Childhood malnutrition is a function of food availability and communicable disease prevalence early in life.

a quarter of the population (6.8 million people) is undernourished.[19]

While Mozambique had a relatively lower burden and peak of HIV/AIDS in the 1990s to 2000s, the country's prevalence and death rates have decreased much more slowly than its peers. Since 2009, AIDS death rate reductions have stagnated and prevalence rates are slowly increasing. IFs forecasts that the AIDS death rate reduction will lag behind most of its regional peers and, by 2040, Mozambique's death rates will trail only Zimbabwe.

Figure 11: AIDs death rates, Mozambique and regional peers, history and forecast (1990 to 2040)



Source: IFs version 7.28, historical data from WHO

While the country's disease burden is still very much skewed toward communicable diseases, as access to clean water, sanitation, and food continues to expand, access to ARTs becomes more prevalent and consistent, and other general improvements to health and lifestyle practices becomes more widespread, the burden will shift more towards non-communicable disease. This epidemiological transition - the slow shift from a disease burden dominated by communicable disease to one that is characterized by more noncommunicable disease (NCD) - means that the Mozambican health system will need to continue to make strides in reducing communicable disease while shifting resources to prepare for more chronic and more expensive NCD prevention and treatment programs. The burden of disease is forecast to slowly shift over to NCDs from the late 2020's to the early 2030's, which means that Mozambique should start to invest in horizontal health systems that can treat across disease types as NCDs become more prominent.

3.4 Scenario Analysis: Extending Health and Nutrition

The Extending Health and Nutrition scenario simulates the successful implementation of a set of

[19] Undernourishment (as a percent of population) is a measure of hunger across the population and is a function of the amount of available calories for consumption and the distribution of those calories in the country.

interventions that aim to reduce the burden of the most prevalent diseases in Mozambique while improving overall health infrastructure and extension. The scenario includes interventions that increase safe water and improved sanitation access, reduce indoor air pollution from solid fuel use, extend communicable disease prevention and treatment (with particular focus on HIV/AIDS and malaria), increase access to calories, and more broadly strengthen horizontal health systems. Figure 12 provides additional detail regarding the size and justification of the interventions found within the Extending Health and Nutrition scenario.

Figure 12: Extending Health and Nutrition interventions

Intervention	Description
HIV/AIDS Mitigation	Reduces AIDS death rate by 30% between 2017 and 2022. Namibia achieved a 43% decrease in AIDS deaths between 2006 and 2011.
Reducing Malaria	Reduces the number of malaria deaths by 30% between 2017 and 2022. Between 2005 and 2010 Mali, Nigeria and Angola achieved at least 30%, 31% and 36% reduction in malaria deaths, respectively.[20]
Improved Sanitation	Increases access to improved sanitation facilities from 22% to 31% between 2017 and 2022. Angola increased sanitation access from 23.5% to 29.4% between 1993 and 1998.
Access to Safe Water	Increases access to safe water sources from 52% to 59% between 2017 and 2022. Malawi achieved over 10% increase between 1990 and 1995.
Reducing Solid Fuel Use	Reduces the number of households that use indoor solid fuel (i.e. dung, wood) from 90% to 80% between 2017 and 2022. Angola achieved a 15 percentage point reduction between 1996 and 2001.
Caloric Availability	Increases effective demand from 2 200 calories to 2 500 calories between 2017. Angola achieved 16% increase between 2000 and 2005
Horizontal Health	Decreases the aggregate death rate from 10.17 per 1 000 in 2017 to 8.39 per 1 000 in 2022 (8.59 in the Current Path).

The Extending Health and Nutrition scenario decreases total disability-adjusted life years (DALYs)[21] lost from communicable disease by nearly 9% compared to the Current Path in 2040. It reduces infant mortality by 8% and reduces the number of undernourished children by over 138 000 over the Current Path by 2040. Given the range of health interventions found within the Health Extension scenario, the effects of individual components of the scenario are outlined below.

The Horizontal Health, HIV/AIDS Mitigation, and Reducing Malaria interventions have the largest individual impacts on life expectancy and overall morbidity and mortality, as measured by DALYs. The HIV/AIDS Mitigation scenario reduces the AIDS death rate by 11% compared to the Current Path.[22] Meanwhile, the Reducing Malaria intervention averts a total of 48 000 malaria deaths by 2040 relative to the Current Path. Since having malaria increases the relative risk of other diseases, this scenario also helps to somewhat reduce the burden of diarrhea and other communicable diseases.

[20] WHO. Estimated Deaths. Estimates by country. http://apps.who.int/gho/data/view.main.14119?lang=en

[21] Disability-Adjusted Life Years (DALYs) for a disease or health condition are calculated as the sum of the Years of Life Lost (YLL) due to premature mortality in the population and the Years Lost due to Disability (YLD) for people living with the health condition or its consequences. http://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/

[22] IFs forecasts an increase in HIV prevalence under this scenario, as people begin live longer.

The Horizontal Health, Improved Sanitation, and Caloric Availability scenarios all have a large impact on infant mortality. Water, sanitation, and food availability all help to reduce levels of child undernutrition, which in turn lowers the vulnerability of these children to communicable diseases.

Reductions in undernutrition and stunting from improved access to sanitation and safe water have large impacts on productivity. Improved Sanitation results in a cumulative US$5.3 billion increase in GDP relative to the Current Path in 2040, with Safe Water resulting in an increase of US$1 billion. While Increasing Caloric Availability also serves to significantly reduce undernutrition (in both children and adults) and stunting, the positive gains to GDP are offset by an increase in agricultural imports to supply the additional food necessary to increase food availability.

Figure 13: Impact of Extending Health and Nutrition interventions on selected indicators (percent change relative to the Current Path), 2040

	Percent improvement relative to Current Path in 2040						
	HIV/AIDS Mitigation	Reducing Malaria	Reducing Solid Fuel	Improved Sanitation	Access to Safe Water	Caloric Availability	Horizontal Health
Infant Mortality rate	0.4	1.9	0.4	2.8	1.1	2.1	2.4
Life Expectancy	0.2	0.1	0.1	0.1	0.0	-0.1	0.6
Undernourished Children	-0.2	0.2	0.0	12.8	5.3	11.5	0.0
Hunger	-0.1	0.0	0.0	0.4	0.1	20.9	-0.1
Stunting Rate	0.0	0.2	0.1	0.8	0.3	1.6	0.1
AIDS Deaths rate	10.0	0.0	0.0	0.0	0.0	0.0	2.5
GDP	0.2	0.1	0.0	0.9	0.2	-0.8	0.4

Source: IFs version 7.28

Figure 13 above provides greater detail regarding the impact of each intervention and illustrates some of the tradeoffs associated with pursuing one set of sectoral policies over another. For example, without programs aimed at extending access to food, safe water, or improved sanitation, an intervention which reduces deaths from HIV/AIDS is likely to increase the number of children and adults suffering from undernutrition. These tradeoffs are particularly evident in health systems, where reducing the burden of one disease will increase the burden of another at some later point in time.

It is also important to note that since many of these interventions reduce mortality without addressing issues of economic opportunity, the number of people living in extreme poverty in Extending Health and Nutrition is forecast to be 2% higher than in the Current Path by 2040. However, these improvements in health outcomes (such as stunting and undernourishment) also have significant benefits on cognitive ability, which, combined with improvements in education, could improve productivity and poverty outcomes in the long run.

3.5 Education

Education systems can best be thought of as a pipeline. Children start at the beginning (primary enrollment) and progress through each successive level (lower secondary, upper secondary and

possibly tertiary) in the system to emerge with, in theory, appropriate levels and types of education suited to the economic needs of the country. Ensuring that the majority of children make it through key transition points (i.e. from primary to secondary school) is therefore critical. In Mozambique's case, a significant bottleneck between primary and lower secondary school constrains educational attainment.

Figure 14: Education flow rates, Mozambique, 2016[23]

	Primary		Lower Secondary		Upper Secondary		Tertiary	
	Enroll (gross)	Survival	Enroll (net)	Survival	Enroll (net)	Survival	Enroll (net)	Graduation
Mozambique	105.8	37.4	33.1	72.0	13.9	87.8	6.1	1.4
Africa	102.1	75.5	62.5	77.0	38.0	86.2	12.3	7.4
World	106.5	91.3	92.8	90.5	72.6	88.2	37.3	22.0

Source: IFs version 7.28, historical data from UIS

Mozambique's educational attainment is one of the lowest in the world. It's average number of education years (for adults 15+) is 2.5 years, which ranks 52nd in Africa (out of 54) and 184th globally (out of 186). Only about 50% of the adult population (aged 15+) is literate, which is 10 percentage points lower than any regional peers and ranks 170th in the world. Less than 30% of the adult population has completed primary school and only 5% of adults have completed secondary education.

Primary school enrollment rates in Mozambique stand at 88% (net) and 105% (gross), but the percent of enrolled primary students that make it to the final grade of primary school is extremely low. Mozambique's primary survival rate is 37.5%, which is only ahead of Somalia in global rankings. So, while many children get into school, very few make it to the end of primary - meaning the pool of children who can advance to secondary and tertiary school is very small.

Primary school is free and compulsory in Mozambique, but barriers like cost of supplies, preschool malnutrition, gender roles and transport infrastructure limit the ability of students to access and stay in school.[24] Early marriage for girls also poses barriers for female students persisting to the last grade of primary school.[25] Reducing these barriers and ensuring students stay in primary school, and receive quality education will help increase both primary survival rates and overall educational attainment.

There is also a significant bottleneck at the transition between lower secondary and upper secondary school. Only 23% of students who enter lower secondary school graduate and only 70% of those students who graduate from lower secondary school move on to upper secondary. This means that the already small pool of students who make it through primary gets even smaller further along the pipeline. The result is that very few students make it to upper secondary

[23] Net enrolment rate is expressed as a percent of age appropriate children. Gross enrolment rate consists of the actual number of children in that grade divided by the age appropriate number and expressed as a percent.

[24] World Bank. Mozambique Service Delivery Indicators, Education. (2015, March) http://documents.worldbank.org/curated/en/287341468181503193/pdf/95999-WP-PUBLIC-Box391432B-ADD-SERIES-ENGLISH-WB-Mozambique-SDI-Brief.pdf

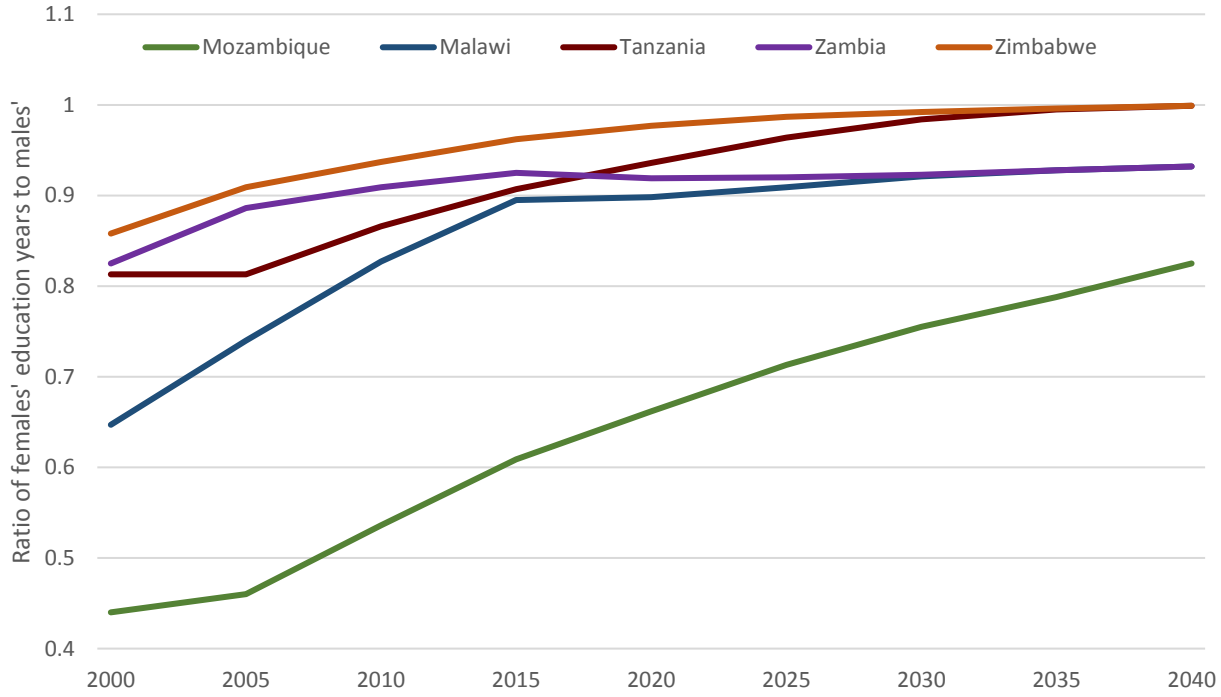
[25] Roby, J. L., Lambert, M. J., & Lambert, J. (2009). Barriers to girls' education in Mozambique at household and community levels: An exploratory study. *International Journal of Social Welfare*, *18*(4), 342-353.

education and even fewer move on to tertiary education.

IFs forecasts that primary survival and completion, and secondary enrollment and completion rates will rise over the next 23 years.[26] While the primary survival rate and secondary enrollment rate (net) are forecast to double by 2040, millions of children will have missed out on a full education in the intervening years. By 2040, the IFs Current Path suggests that only 60% of adults (15+) will have completed primary education and only 17% of adults will have completed secondary education. The outcomes and benefits of improving education take decades to manifest and the more children Mozambique can get through primary school and into secondary school now, the better.

Mozambique also has a severe gap between male and female attainment. The average educational attainment (aged 15+) is 3.2 years for males and only 1.9 years for females. Again the problem stems from primary school enrollment and survival; only 86% of school aged females enroll in primary school (90% for males), only 32% of enrolled females make it to the last grade (34% for males), and only 70% of females who completed primary move on to lower secondary school (67% for males).

Figure 15: Gender Parity (mean education years adults 15+), Mozambique and regional peers, history and forecast (2000 to 2040)



Source: IFs version 7.28, historical data from UIS

As a result, Mozambique ranks 50th in Africa on gender parity (behind the DRC) and has the lowest gender parity score of any of its regional peers. While the gender gap is forecast to improve over the next 23 years, Mozambique will still have the lowest gender parity score of its peers in 2040. While female education is important for a myriad of reasons, there is a key linkage between

[26] The primary survival rate is the percent of children enrolled in primary school who make to the final grade. The completion rate is the percent of adults that have completed primary or secondary education.

female secondary education and lower fertility rates. Furthermore, female education improves productivity, gets women into the workforce and can have knock-on health effects for both women and children.

3.6 Scenario Analysis: Advancing Education

The Advancing Education scenario is a comprehensive scenario that aims to widen bottlenecks and increase overall educational attainment in Mozambique. It is made up of 6 separate interventions that represent a five-year push to improved outcomes at various stages along the education pipeline.

Figure 16: The Advancing Education interventions

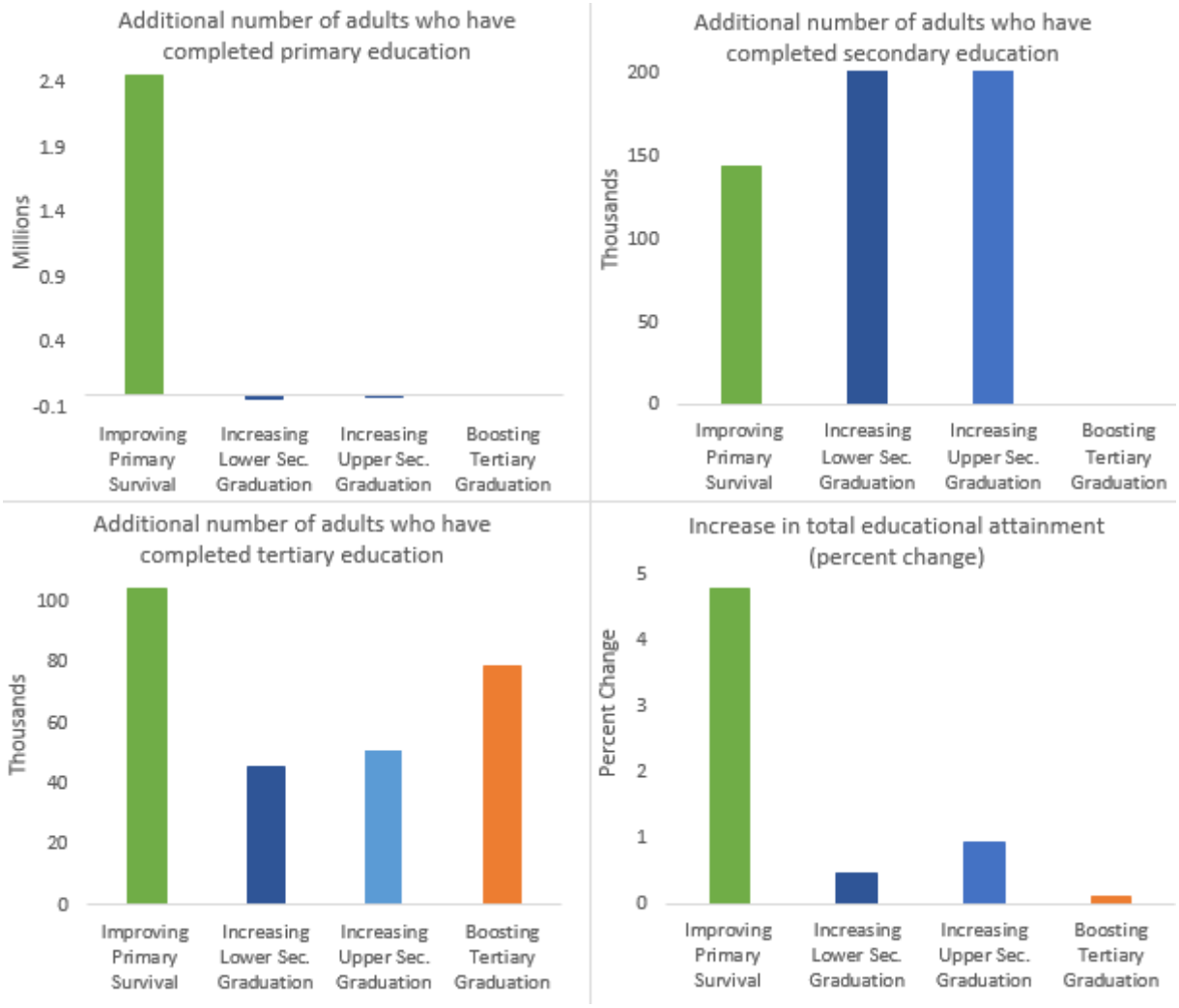
Intervention	Description
Improving Primary survival	This intervention increases the number of enrolled primary school students who make it to the last grade of primary school from 39% to 53%. Malawi achieved a similar increase between 2005 and 2010.
Increasing lower secondary enrollment	This intervention increases the ratio of primary graduates that enroll to secondary school from 71% to 80% in 2022. Lesotho achieved an even higher increase in transition rates from primary to lower secondary between 2000 and 2005.
Increasing lower secondary graduation	This intervention increases the number of students enrolled in lower secondary school that graduate from lower secondary school from 24% to 30% in 2022. Similar increases have been achieved in Lesotho between 2006 and 2013.
Increasing upper secondary enrollment	This intervention increases the number of lower secondary graduates who move on to enroll in upper secondary school from 70% to 76% in 2022. Lesotho and Zambia achieved even higher increases between 2000 and 2005
Increasing upper secondary graduation	This intervention increases the number of students enrolled in upper secondary school that graduate from lower secondary school from 16% to 21% in 2022. Swaziland achieved a similar increase between 2005 and 2010.
Boosting tertiary graduation	This intervention increases tertiary graduation from 1.5% to 2% in 2022.

The Advancing Education scenario increases the overall average educational attainment level of Mozambique to 5.5 years by 2040 (compared to 5.2 in the Current Path). The scenario increases primary survival to 81% by 2040, compared to only 60% along the Current Path. As a result, over 1.4 million more adults (aged 15-65) will have completed primary school by 2040. The Advancing Education scenario also increases the number of students who enroll and complete secondary school. By 2040, nearly 84% of age appropriate students enroll in secondary school (compared to 76% in the Current Path) and 45% of students graduate from secondary school (compared to 41% in the Current Path). This means that, by 2040, nearly 550 000 more Mozambicans will have completed secondary education.

If we break down the components of the Advancing Education scenario, it is evident that the Primary Survival intervention drives improvements across a number of broader education indicators. Increasing Primary Survival provides the largest boost to overall educational attainment and has a significant impact on the transition rates into secondary school, secondary graduation and enrollment in tertiary education compared to the other individual interventions. In fact, the

Primary Survival intervention has the largest effect on both primary and tertiary completion rates (see Figure 17 below). This is because improvements at lower levels of education increase the total number of students eligible to move through secondary and tertiary education.

Figure 17: Impacts of the key components of the Advancing Education scenario on primary, secondary, and tertiary completion and educational attainment (compared to the Current Path), 2040



Source: IFs version 7.28

The Advancing Education scenario also increases educational gender parity by 5.5% and the number of females graduating from secondary school by 10% compared the Current Path. This increase in female education has a positive impact on fertility rates. In this scenario, fertility rates are reduced by over 2.5% against the Current Path in 2040.

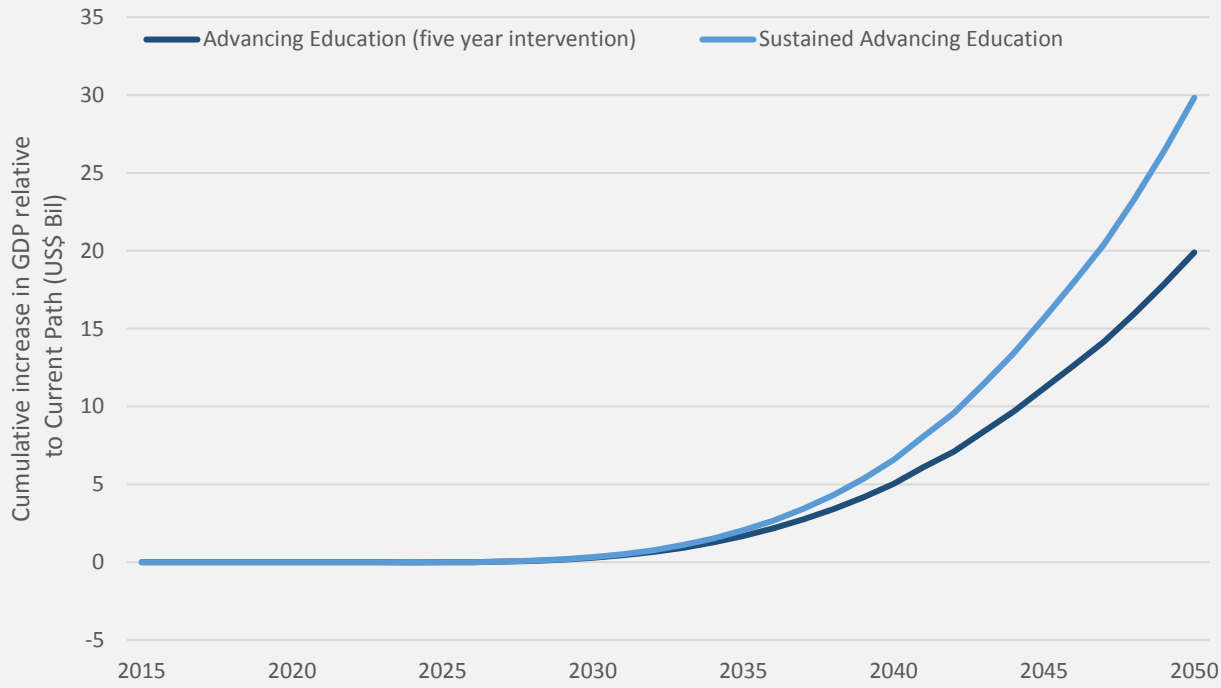
Building Education Momentum

Education systems are slow moving. An intervention to move children through the entire education system now won't fully succeed until they are through secondary school. The benefits of a five-year intervention to improve primary education survival now likely won't be fully realized until even later than 2040. By the late 2020s, the five-year push to remove bottlenecks in the Advancing Education scenario results in nearly a million additional students enrolled in the education system relative to the Current Path. However, even with this significant increase, average years of adult education is forecast to increase by only .4 (compared to the Current Path in 2040).

Sustaining interventions for longer than five years can help ensure that the youth of today will be able to contribute to the economy and society far into the future. The Sustained Advancing Education scenario extends the five-year intervention by another 28 years, simulating a long-term, sustained effort to invest in education outcomes and human capital. The Advancing Education scenario provides an additional US$20 billion in cumulative GDP by 2050 relative to the Current Path. However, the Sustained Advancing Education scenario boosts GDP by US$30 billion relative to the Current Path; that is US$10 billion more than the impact of the five-year Advancing Education push in 2050 (see Figure 18).

Further, Figure 18 shows that in both scenarios the positive effects of advancing education start to accelerate past 2040. By 2040, the two scenarios add only a cumulative US$5 billion and US$7 billion, respectively, however, only 10 years later, the gains are four times higher in both scenarios.

Figure 18: Comparing the GDP impacts of five-year and sustained Advancing Education scenarios to 2050



Source: IFs version 7.28

Furthermore, improvements in female education will help to boost economic prospects and productivity for women in the workforce. This is especially pertinent for the agricultural sector, as women make up much of the informal agricultural workforce.[27]

[27] Saquina Mucavele, MuGeDe- Women, Gender and Development, Republic of Mozambique-Southern Africa (2013).*The Role of Rural Women in Agriculture*. http://www.wfo-oma.com/women-in-agriculture/articles/the-role-of-rural-women-in-agriculture.html

3.7 Agriculture

Like many other low-income African countries, Mozambique's agricultural sector is dominated by small-scale, subsistence farming. While the sector accounts for only a quarter of value added in the economy, it is an integral part of both the Mozambican economy and society. There are approximately 3.2 million small-holder farmers who account for 95% of total agricultural production.[28] In 2014, 72% of the labor force was engaged in agriculture (down from 80% in 2000), which means that most individuals in Mozambique rely on agriculture as a means of income or subsistence.[29]

Mozambique nearly tripled total agricultural output over the past 20 years, from 7 million metric tons in 1995 to nearly 21 million metric tons in 2011.[30] Over the same time period, agricultural production per capita increased by 78%. Within the region it trails only Tanzania in total production and only Malawi in production per capita. IFs forecasts that production per capita will decline over the time horizon, which is largely a function of slowing increases in land under cultivation and a rapidly growing population.

Mozambique's recent increases in total production are due to a combination of increases in land under cultivation and increases in yield. Since 1995, the country has increased land under cultivation by 50%, from 3.8 million hectares to nearly 6 million hectares. Over the same period, it increased yields per hectare by 76%, from 2 tons per hectare in 1995 to 3.6 tons per hectare today (which ranks 15th in Africa).

IFs forecasts that yields and land use will continue to grow, but land use will increase at a slightly slower rate than in the last 15 to 20 years. The US Department of Agriculture (USDA) estimates that 49 million (of a total 79 million) hectares are potentially arable, but much of the land is forest (27 million hectares) or is used for grazing (31 million hectares).

To date, the country's gains in yield and expansion of land area have been enough to keep up with food demand.[31] However, as Mozambique develops, individuals will be able to consume more and it is likely that food preferences will change (i.e. meat consumption will rise as a percent of total consumption). Unless Mozambique's agricultural sector can increase yields and continue expansion of land under cultivation, food demand will begin to outstrip domestic food supply.

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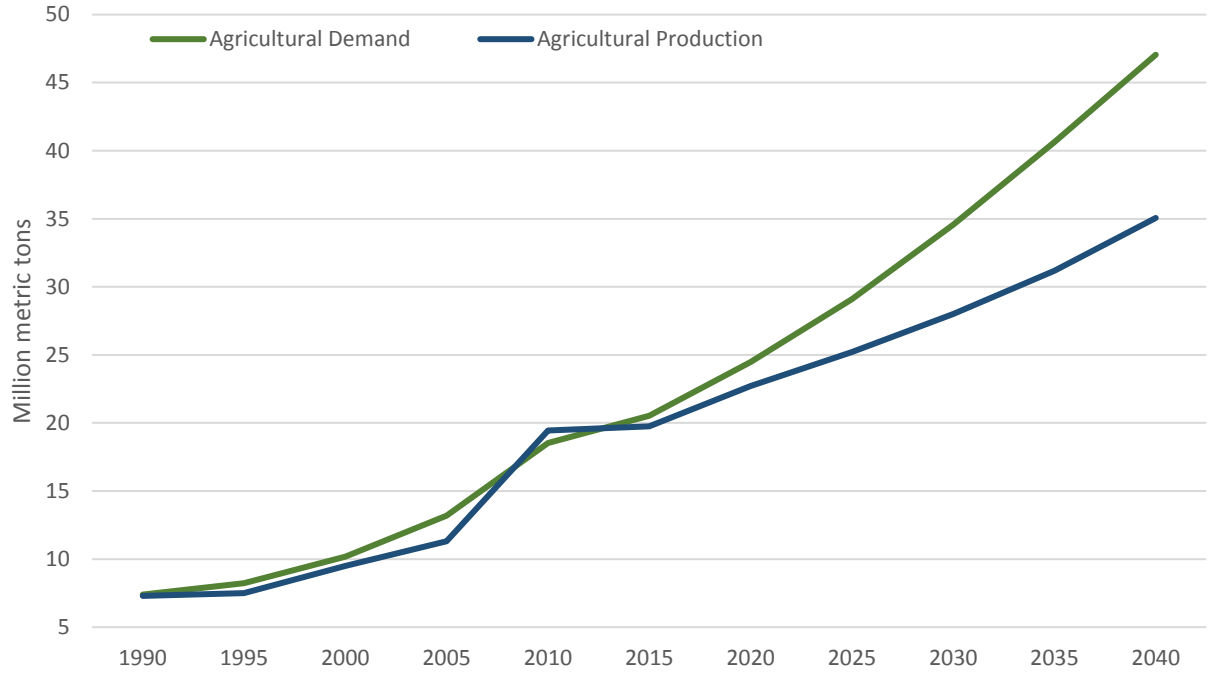
[28] Food and Agriculture Organization, Mozambique at a glance, http://www.fao.org/mozambique/fao-in-mozambique/mozambique-at-a-glance/en/

[29] S. Jones, Growth is not enough for Mozambique's informal workers, World Bank, http://blogs.worldbank.org/jobs/growth-not-enough-mozambique-s-informal-workers

[30] Over half of agricultural production in Mozambique is concentrated in staples like maize (29%), cassava (13%) and sorghum (11%).# The FAO estimates that 80% of all small-holder farmers farm maize or cassava, and that those two crops cover about a third of total agricultural land. Mozambique's main export crop is tobacco (37% of export value), followed by sugar (12%), cotton (7%), bananas (6%), sesame seeds (6%), nuts (5%) and sunflower seeds (4%). Its main imports are rice, wheat and palm oil; its main import partners are South Africa and Thailand. (US Foreign Agricultural Service, Mozambique Agricultural Economic Fact Sheet)

[31] In IFs, food demand is conceptualized as an effective demand, which is made of two components: access to calories and ability to purchase or consume those calories.

Figure 19: Agricultural demand and supply, Mozambique, history and forecast (1990 to 2040)



Source: IFs version 7.28, historical data from UN Food and Agriculture Organization (FAO)

As food demand outpaces supply, Mozambique will need to fill the gap with food imports. Along the Current Path, IFs forecasts that Mozambique's food import dependence will increase from 5% in 2016 to 25% in 2040. This increase in food imports could have major implication for food security in the country. The larger the amount of total food consumption that is dependent on imports, the greater the risk that the country could be affected by external food price shocks and exchange rate volatility. If the country does not increase agricultural production to meet current and future needs, it will become reliant on food imports and therefore chronically food insecure. The possible negative effects of climate change on Mozambique's agricultural sector will only compound the food security situation.

Expected increases in temperature and rainfall from climate change will likely have negative effects on agricultural production and resilience.[32] Because subsistence and small-holder farmers often depend on rainfall, they are the most affected by changes in precipitation, which are set to become more varied. The effects of climate change will vary from region to region, but extreme weather patterns, such as droughts and severe flooding (as seen in Mozambique in January 2017),[33] can both have a devastating effects on subsistence agriculture. In 2012, the government of Mozambique introduced a National Climate Change Adaptation and Mitigation Strategy recognizing the importance of climate change adaptation and mitigation.

[32] IFs takes climate change into account largely through the agricultural sub-module via crop yields. It models the effects of carbon dioxide concentrations as well as temperature and precipitation on crop yields. However, climate change can also have significant impacts on the provision of basic infrastructure. Extreme flooding in the north has destroyed roads and damaged rail lines, while drought and water shortages in the south impede access to clean water sources.

[33] Mozambique floods: Death toll hits 44, schools closed, railway line damaged. News24. 26 January 2017. http://www.news24.com/Africa/News/mozambique-floods-death-toll-hits-44-schools-closed-railway-line-damaged-20170125

3.8 Scenario Analysis: Boosting Agricultural Production

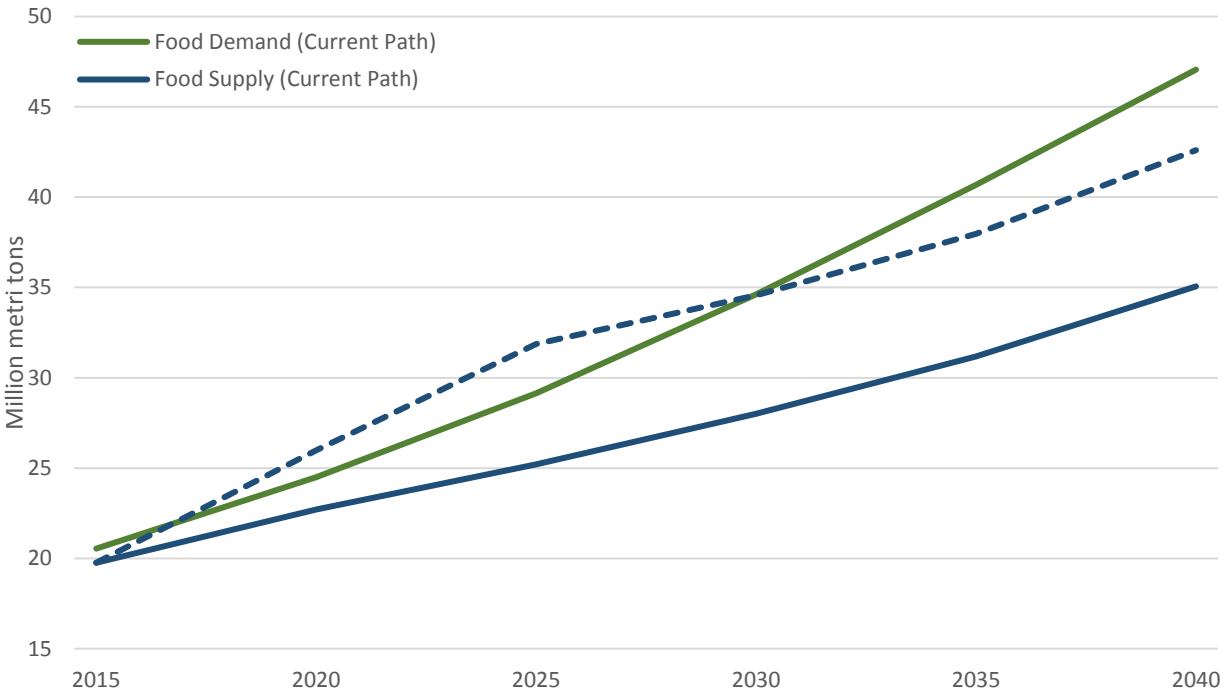
The Boosting Agricultural Production scenario simulates the successful implementation of programs aimed at increasing crop yields and expanding land under cultivation to increase total agricultural production over the next five years.

Figure 20: Boosting Agricultural Production interventions

Intervention	Description
Increasing Crop Yields	Increases agricultural yields from 3.7 metric tons per hectare to 4.7 metrics tons per hectare between 2017 and 2022. Angola increased yields from 4 to 5.7 metric tons per hectare from 2005 to 2010.
Expanding Land Under Cultivation	Increases crop land under cultivation from 6.1 million hectares to 6.8 million hectares between 2017 and 2022. Mozambique saw a similar increase (4.2 to 5.3 million hectares) between 2000 and 2005.

The Boosting Agricultural Production scenario increases total crop production by 22% (7.5 MMT) compared to the Current Path in 2040.[34] This results in a three-fold increase in Mozambique's crop exports by 2040 relative to the Current Path and narrows the gap between domestic production and demand (see Figure 21).

Figure 21: Agricultural demand and supply, Mozambique (Current Path and Boosting Agricultural Production scenario), forecast (2015-2040)



Source: IFs version 7.28, historical data from FAO

By 2040, agricultural value added increases by a cumulative US$22 billion relative to the Current Path, and overall GDP increases by US$57 billion. As a result, there are 2.5 million fewer people living in extreme poverty by 2040 than forecast in the Current Path.

[34] The increasing yields intervention boosts production by 5 million metric tons (MMT) and the expanding land under cultivation intervention increases production by 2.5 MMT.

However, without a demand side intervention aimed at making food more accessible to those that need it, these interventions do little to reduce hunger over the medium term (less than half a percent reduction in the number of undernourished children by the end of the intervention), as most of the additional production is sold on the global market. Similarly, any policy aimed at increasing access without also increasing domestic production will likely lead to greater import dependence and leave the country more vulnerable to economic or environmental shocks.

In this sense, international donors and the GoM must carefully balance growth and development priorities to not only ensure hunger reduction and food security, but to set a path towards long-term sustainable development across all sectors.

4. TRANSFORMING GROWTH INTO DEVELOPMENT

The ability of the government to protect its citizens, provide basic services and foster social inclusivity underlies any long term development strategy. IFs conceptualizes governance across three dimensions: security, capacity and inclusion. These dimensions are based on historical development of governance via the three primary transitions conceptualized in modernization theory.[35] Traditionally, these transitions have occurred in order (security to capacity to inclusion), but they are all heavily inter-connected and do not necessarily occur sequentially.

The inter-connectedness of the three transitions also means that outcomes in each are often closely linked. Lack of inclusion can drive insecurity and insecurity can drive a lack of capacity, or vice versa. In this sense, the three measures can be conceptualized as a governance triangle: each area is a distinct and necessary pillar of governance but each is also intrinsically linked to the other two areas.

Mozambique currently has high levels of political inclusion compared to other countries at its level of development (though low for the region) and ranks relatively well in gender empowerment (19th in Africa). While Mozambique has been relatively stable over the past two decades, the existence of a large and growing youth bulge alongside the recent increase in political violence following the disputed 2014 elections heightens the risk conflict going forward.

Although levels of government capacity[36] and effectiveness[37] are also generally in line with the country's level of development, Mozambique's ability to provide basic services has lagged far behind the needs of its population and growth has not benefitted many of the poorest and most vulnerable in the country. Further, government effectiveness has been declining over the past 20 years and budget revenues are heavily dependent on waning donor assistance. In this context, the influx of gas revenues could prove to be a double edged sword, providing both the opportunity to extend access to basic goods and services and promote inclusive growth, but also the risk of perpetuating the status quo of governance.

Failure to address government capacity will not only make it difficult for the GoM to successfully manage and reinvest gas windfalls, it represents a long term threat to development regardless of whether gas production starts on time or not.

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[35] The security transition begins with consolidation of territory, establishment of sovereignty and the monopolization of the use of legitimate violence. The capacity transition occurs as governments create and build the capacity to effectively administer that sovereign territory. The inclusion transition occurs as society develops a social contract required to sustain social progress. (Barry B Hughes, Devin K Joshi, Jonathan D Moyer, Timothy D Sisk and José Solórzano, Patterns of Potential Human Progress volume 5: Strengthening Governance Globally, Paradigm, Oxford University Press, Boulder, 2014, p 6)

[36] Government capacity is defined within IFs as the ability to both raise funds (revenue) and allocate those funds to productive endeavors.

[37] Government effectiveness (as measured by the World Bank) captures perception of the quality of public service, the quality of civil service and degree independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. http://info.worldbank.org/governance/WGI/#doc

4.1 Government Capacity

Capacity can be thought of as the ability for governments to raise and efficiently deploy revenue towards public goods, services, and systems.[38] In this sense, revenue generation increases capacity, whereas corruption undermines it.[39] At first glance, Mozambique's capacity appears on par with others on the continent. Mozambique ranks in the middle of the pack on governance indicators within Africa (though it ranks in the lower third globally). Meanwhile, it's revenue to GDP ratio stands at nearly 40%.

Figure 22: Government capacity indicators, Mozambique, 2016

	African Rank (out of 54)	World Rank (out of 186)
Transparency Index (corruption)	29	129 (out of 176)
Government Effectiveness Index	28	145
Government Revenue	12	50
Government Revenue minus aid	15	91

Source: IFs version 7.28, Transparency International, World Bank

However, the country's government effectiveness score has been trending down for the past 20 years and, while transparency has been slowly improving, the recent debt scandal has called those gains into question. In other words, the GoM's ability to effectively manage revenues has been declining even in the absence of gas revenues. Moreover, Mozambique is and has been heavily reliant on overseas development assistance to finance its development. .

Since the mid-1990s, aid receipts have averaged nearly 21% of GDP. In 2016, aid receipts accounted for over 10% of GDP, but they still made up over a quarter of total government revenue. Moreover, donors have provided extensive General Budget Support to help the government fund poverty and development programs.[40] While the influx of aid dollars and continuing budget assistance has helped Mozambique improve human development outcomes and increase growth, it also calls into question the government's ability to raise and effectively allocate funds in the absence of this support.

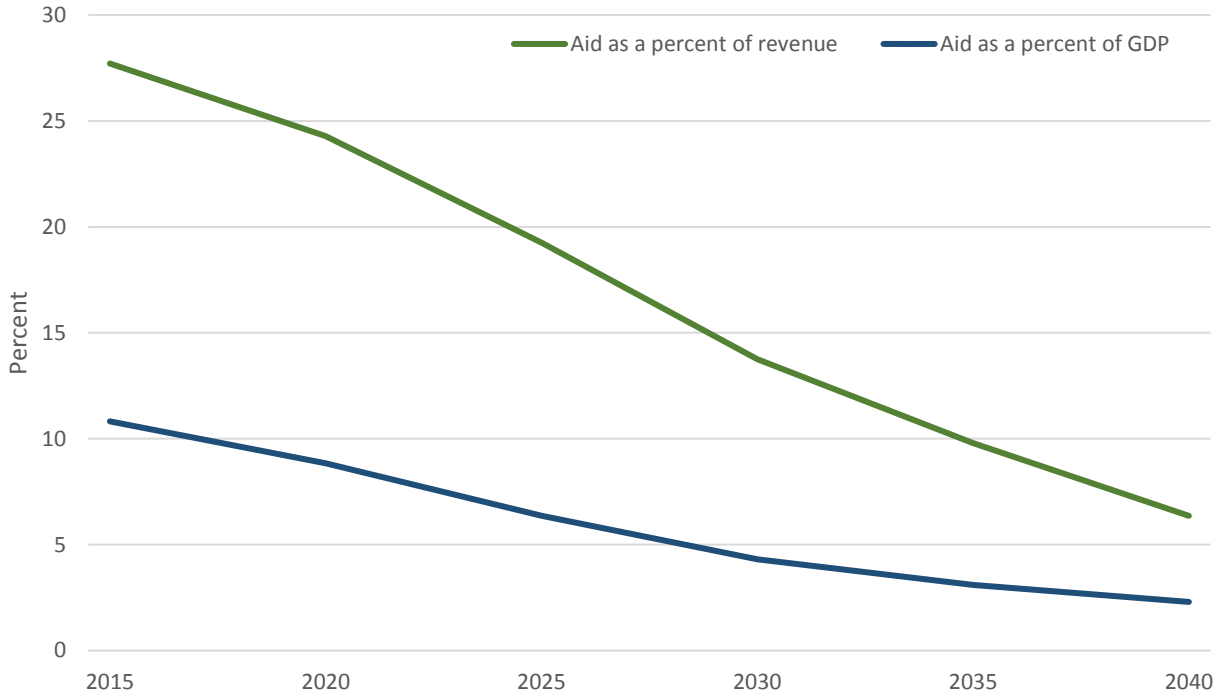
In one sense, the windfalls from gas extraction could help relieve Mozambique of donor dependence. In another sense, Mozambique's low levels of capacity to administer that extra revenue could lead to mismanagement. The recent discovery of nearly US$1.4 billion (11% of GDP) in undisclosed government backed debt and the recent default on the sovereign bond points to key risks that will need to be addressed in order for the country to harness resource profits effectively.[41]

The undisclosed debt plus a sharp devaluation of the metical pushed Mozambique's largely dollar

[38] Revenue includes domestic revenue collection and aid contributions.
[39] Corruption as measured by Transparency International's Corruption Perception Index.
[40] I Gqada. A Boom for Whom? Mozambique's Natural Gas and the New Development Opportunity. South African Institute of International Affairs. August 2013
[41] Boats and a scandal: Mozambique's default. The Economist. 19 January 2017. http://www.economist.com/news/middle-east-and-africa/21715030-mozambique-fails-pay-its-debts

denominated debt to unsustainable levels, with the debt to GDP ratio reaching nearly 130%. This caused the IMF to suspend its programme and donors to suspend General Budget Support. Looking forward, bilateral aid is expected to average about US$2.1 billion per year over the time horizon.[42] This means that, by 2040, aid as a portion of GDP will have fallen from 10.5% now to just over 2% of GDP in 2040.

Figure 23: Aid receipts, Mozambique, forecast (2015 to 2040)



Source: IFs version 7.28

The increase in debt and reduction in aid has implications for the GoM's ability to maintain and increase access to social services in the near to medium term.[43] The GoM will need to balance the cost/implications of the debt repayment and restructuring with the cost of providing education, health, and other public services.

Risks highlighted by the current debt crisis, paired with reliance on waning external assistance and downward trends in government effectiveness, suggest that the GoM may have difficulty improving capacity and service delivery in the lead up to gas production. Steps have been taken to ensure transparency, but even if Mozambique is able to minimize resource rent-seeking, it will need to improve its ability to effectively manage government revenues and funnel resource rents toward programs that further human and economic development.

4.2 Scenario Analysis: Strengthening Governance

The Strengthening Governance scenario simulates an increase in transparency, government effectiveness and economic and social inclusion over the next five years. Figure 24 below outlines

[42] After extensive consultation with aid experts and donors, the IFs Current Path forecast of bilateral aid was adjusted to reflect a relative stagnation of bilateral aid over the next 23 years. See Annex for details.
[43] The Current Path assumes that debt levels (in absolute terms) remain relatively flat over the next 10 to 15 years.

each intervention included in the Strengthening Governance scenario.

Figure 24: Strengthening Governance Interventions

Intervention	Description
Improving Transparency	Increases government transparency from 3.1 to 3.4 between 2017 and 2022. Namibia achieved an even higher increase between 2012 and 2015.
Increasing Government Effectiveness	Improves Government Effectiveness from 1.7 to 1.9 between 2017 and 2022. Angola and Zambia achieved similar increases between 2006 and 2011 and 2009 and 2014 respectively.
Expanding Economic Freedom	Improves economic freedom from 5.9 to 6.6 between 2017 and 2022. Zambia increased economic freedom index between 1990 and 1995 from 3.1 to 4.8.
Increasing Gender Empowerment	Improves gender empowerment from .35 to .38 between 2017 and 2022. Namibia and Botswana have achieved higher improvements within a five-year period.

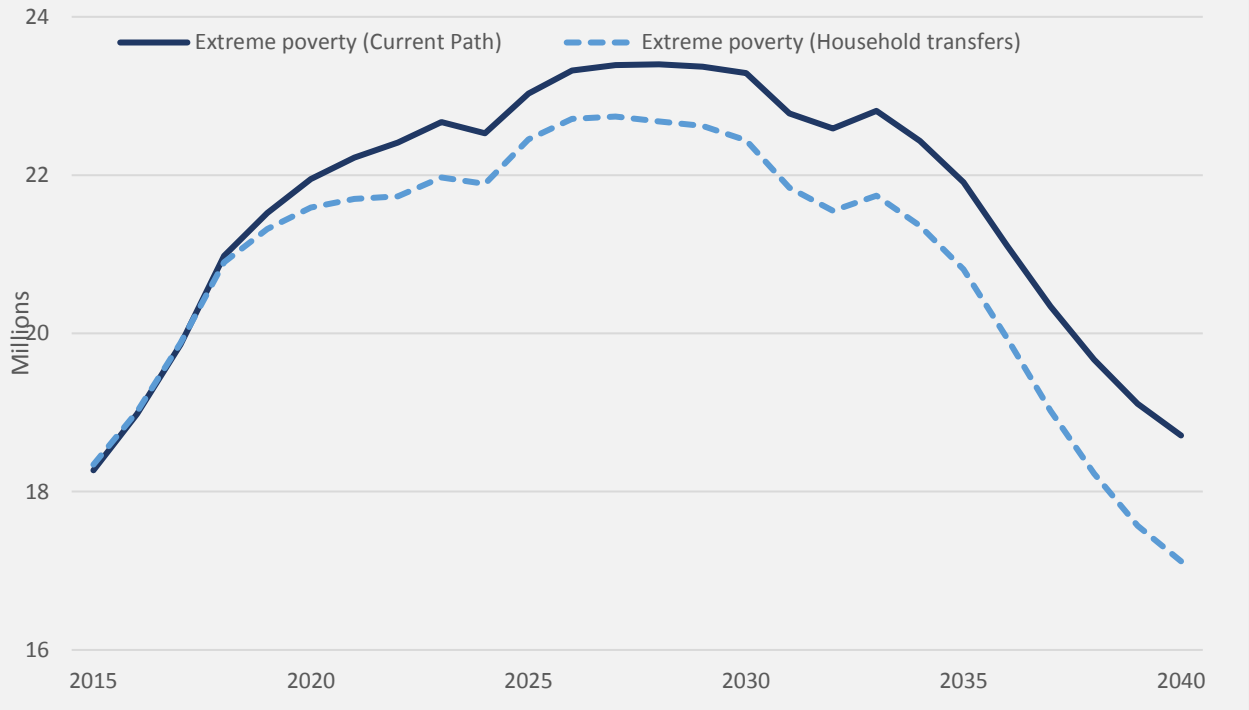
By 2040, the Strengthening Governance scenario increases government revenues by a cumulative total of more than US$17 billion relative to the Current Path. It also increases GDP per capita from about US$2 800 (in the Current Path) to nearly US$3 000 by 2040, an improvement of more than 5%. Moreover, this scenario reduces the number of Mozambicans surviving on less than US$1.90 per day by nearly 1.3 million in 2040 (compared to the Current Path).

Breaking down the scenario into its component parts suggests that improving effectiveness and transparency have the largest impact on improving revenue collection, increasing revenues above the Current Path by 3.1% and 2.7%, respectively in 2040. Improving government effectiveness causes the largest improvement in GDP per capita, improving it by more than 2.5% relative to the Current Path in 2040. Improving government effectiveness also creates a 3.5% reduction in poverty relative to the Current Path, compared to a 1.8% reduction in the improving transparency intervention and 1.3% in the expanding Economic Freedom intervention.

Expanding Household Transfer Programs

The Expanding Household Transfer Programs scenario simulates an ambitious increase in government welfare transfers to unskilled households over the next five years (to close to 3% of GDP by 2022). This direct transfer reduces the number of people living in extreme poverty by 2.3 million, and increases household consumption by a cumulative $22 billion relative to the Current Path by 2040. However, with no additional revenue generation or budgetary support beyond what is already assumed by the Current Path, an intervention of this magnitude (US$540 million annual increase relative to the Current Path by 2022) would also constrain spending on health, education, infrastructure, or other public goods and services.

Figure 25: Extreme poverty, Mozambique (Current Path and Expanding Household Transfers scenario), forecast (2015 to 2040)



Source: IFs version 7.28

5. COMPARING OUTCOMES AND FRAMING UNCERTAINTY

5.1 Sectoral scenarios: Outcomes and tradeoffs

This section brings together the scenarios and analysis from the previous sections to help frame outcomes and tradeoffs of different policy choices across a number of broad development indicators. Each sectoral scenario represents a successful five-year policy push (2018 to 2022) to improve outcomes within that sector. Figure 26 below outlines the scope and contents of each sectoral scenario.

Figure 26: Summary of sectoral scenarios

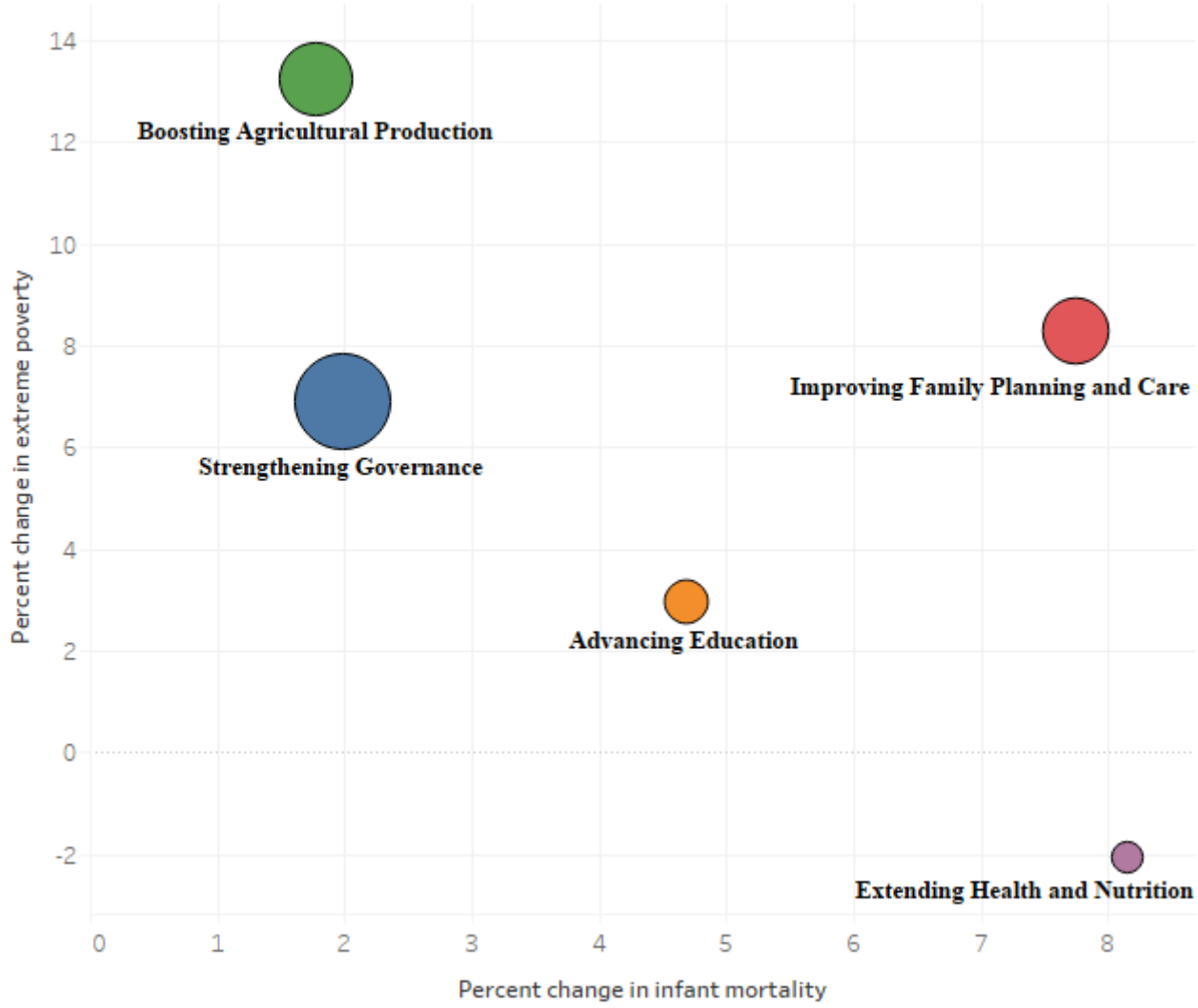
Intervention	Description
Advancing Education	Aims to widen bottlenecks and increase overall educational attainment in Mozambique. It is made up of 6 separate interventions that improve outcomes at various stages along the education pipeline.
Extending Health and Nutrition	Simulates interventions that aim to increase water and sanitation (WASH) access, reduce indoor air pollution, and extend communicable disease prevention and treatment (with particular focuses on HIV/AIDS and malaria), increase access to calories, and strengthen horizontal health systems.
Strengthening Governance	Simulates an increase in transparency and government effectiveness as well as an increase in economic and social inclusion.
Improving Family Planning and Care	Aims to slow rapid population growth in Mozambique by extending access to contraception and family planning services, as well as to reduce the health risks associated with pregnancy, births, and infancy.
Boosting Agricultural Production	Simulates increasing domestic crop production through the successful implementation of programs aimed at increasing crop yields and expanding land under cultivation.

Figure 27 below presents a comparison of the long-term impact of each five-year sectoral scenario across three development indicators: extreme poverty, infant mortality and GDP per capita. The vertical axis represents the percent change in the number of those living in extreme poverty, the horizontal axis represents the percent reduction in infant mortality and the bubble size represents the percent increase in GDP per capita (all compared to the Current Path in 2040).

Boosting Agricultural Production, Strengthening Governance and Improving Family Planning and Care have the largest individual effects on extreme poverty. The Boosting Agricultural Production scenario reduces extreme poverty by 13% (1.5 million people) compared to the Current Path in 2040. Meanwhile, Strengthening Governance and Improving Family Planning and Care reduce extreme poverty by 8% and 9% respectively.

Improving Family Planning and Care, Advancing Education and Extending Health and Nutrition have the most significant impact on infant mortality. The Extending Health and Nutrition and Improving Family Planning and Care scenarios both reduce infant mortality by around 8%, while the Advancing Education scenario reduces infant mortality by over 4.5%.

Figure 27: Impacts of sectoral scenarios on selected development indicators relative to the Current Path in 2040



Source: IFs version 7.28

The Strengthening Governance scenario registers by far the largest increase in GDP (8% increase) and GDP per capita (5% increase) in 2040. However, the Boosting Agricultural Production scenario also increases GDP and GDP per capita by 4% and 3%, respectively, over the Current Path in 2040. Meanwhile, the Improving Family Planning and Care scenario boosts GDP per capita (2.5% increase), but slightly reduces overall GDP. The reduction in population in the Improving Family Planning and Care means that there are less people utilizing the same resources, but it also translates to a small labor force and less total output.

In the Improving Family Planning and Care scenario, there is a tradeoff between population and total GDP output, but every sectoral scenario and intervention also has either implicit or explicit tradeoffs. Therefore, it is important to examine both the positive outcomes and tradeoffs across sectors. Figure 28 below outlines the benefits and tradeoffs between each of the sectoral scenarios across a number of additional development indicators. Each shaded box below represents the percent change in each indicator (compared to the Current Path) under each sectoral scenario (darker blue represents a larger positive impact).

Figure 28: Impacts of sectoral scenarios on selected development indicators (percent change relative to the Current Path), 2040

	Advancing Education	Extending Health and Nutrition	Improving Family Planning and Care	Boosting Agricultural Production	Strengthening Governance
Educational Attainment	6.6	0	-0.2	0.7	0.2
GDP	0.9	1.1	-0.4	4.4	7.9
GDP per Capita	1.1	0.6	2.5	3.1	5.3
HDI	1.6	0.5	0.7	0.5	0.7
Extreme Poverty	2.9	-2.1	8.3	13.3	6.9
Poverty	2.2	-1.6	7.1	9.7	5
Infant Mortality rate	4.7	8.2	7.7	1.8	2
Life Expectancy	0.5	0.8	0.4	0.1	0.1
Undernourished Children	4.8	25.3	12.6	4	2.2
Undernourished Population	1.3	20.8	4.9	2.2	3.2
Population	0.7	-0.2	4	0.1	0.1
Stunted Population	0.6	1.9	4	0.3	0.1

Source: IFs version 7.28

Extending Health and Nutrition reduces the burden of a number of diseases currently plaguing Mozambique, and in doing so improves the lives of those once afflicted. However, without other programs targeting inclusive growth, this scenario also increases the number of people living in extreme poverty. The Boosting Agricultural Production scenario reduces the number of those in extreme poverty and improves GDP, but without coinciding health extension programs it does little to improve life expectancy. Lastly, the Advancing Education scenario has large effects on educational attainment and HDI, but because improvements in education manifest over long time horizons it has one of the lowest effects on overall GDP by 2040.

While each of these sectoral scenarios has benefits and tradeoffs across development sectors, an integrated development strategy can help mitigate these tradeoffs and push Mozambique towards inclusive growth and development. On the other hand, lack of progress across these sectors, a decline in government capacity, and/or a disruption in gas production could perpetuate Mozambique's chronic underdevelopment.

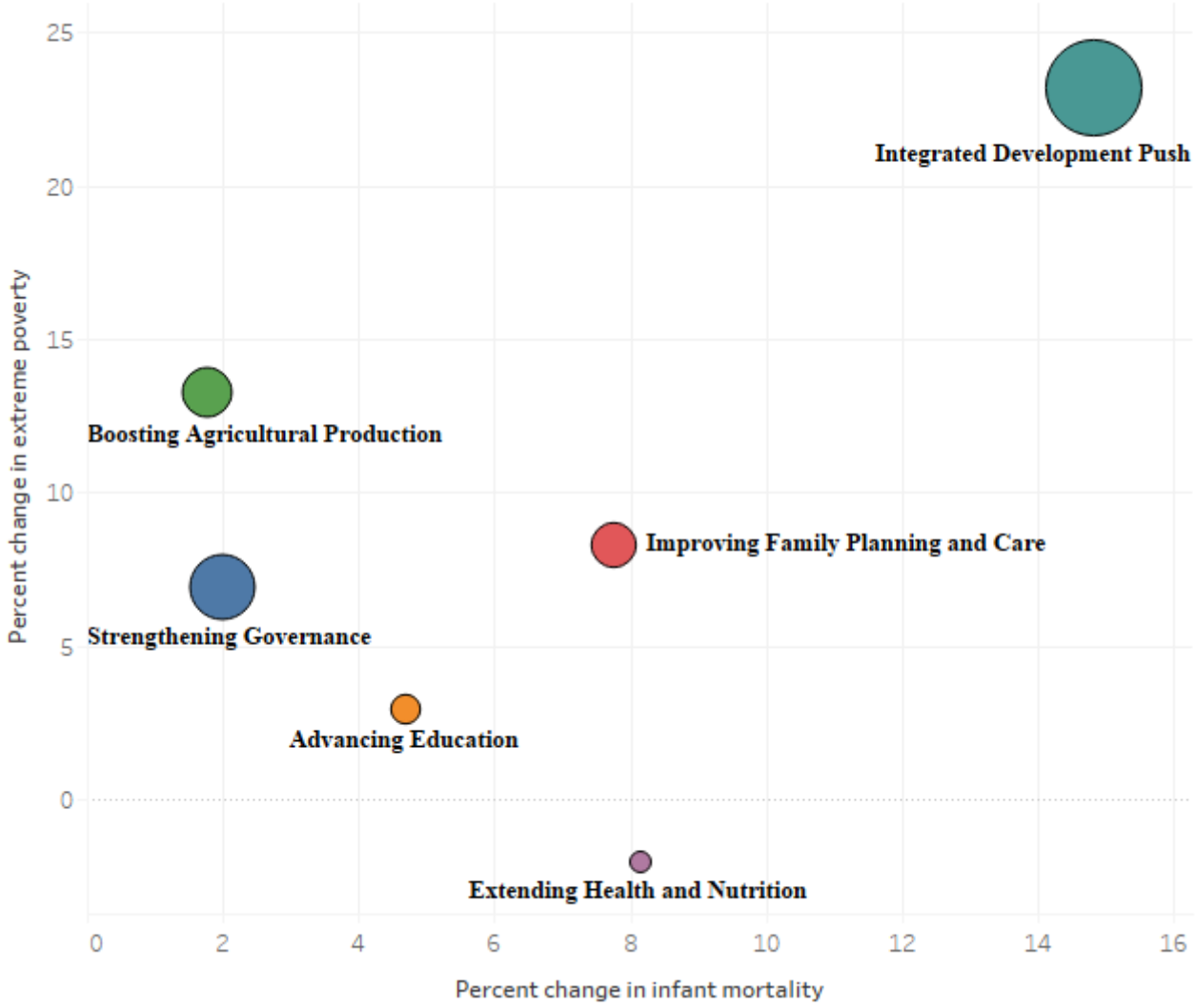
5.2 Framing uncertainty: Integrated development scenarios

This section explores the potential impact of two integrated sectoral scenarios on key development indicators in Mozambique. We will show the effects of 1) a scenario representing a positive development policy push across all sectors and 2) a scenario that represents stalled development across sectors, paired with reduced natural gas production and a continued deterioration of government effectiveness.

The **Integrated Development Push** combines each of the sectoral scenarios outlined in this report to represent a five-year policy push to improve economic, human, and social development in Mozambique. This scenario is meant to demonstrate the synergistic value of pursuing an integrated development strategy across all sectors. Figure 29 below shows the effects of the

Integrated Development Push (along with the individual sectoral scenarios) on extreme poverty, infant mortality and GDP per capita (compared to the Current Path in 2040).

Figure 29: Impacts of sectoral scenarios on selected development indicators (relative to the Current Path), 2040



Source: IFs version 7.28

The Integrated Development Push scenario demonstrates that a positive policy push across these sectors will significantly improve Mozambique's HDI, curb high population growth and massively contribute to poverty reduction and growth. In this scenario, economic growth averages 7.7% per year out to 2040 (compared to 7.1% in the Current Path). This results in a 14% increase in GDP by 2040 and a cumulative increase in GDP of US$113 billion over the next 24 years. In this scenario, Mozambique's HDI improves by 2.7%, the number of those in extreme poverty is reduced by over 23%, hunger is reduced by over 25% and the number of undernourished children drops by a staggering 35%, compared the Current Path in 2040.

Conversely, if development across human, social and economic sectors stalls, Mozambique could see stagnation or regression across key development indicators. The **Stalled Development** Scenario simulates this type of stagnation, along with delays in the expected gas production and a

decline in government capacity. See Figure 30 for details of the stalled development, gas production and governance interventions.

Figure 30: Stalled Development interventions

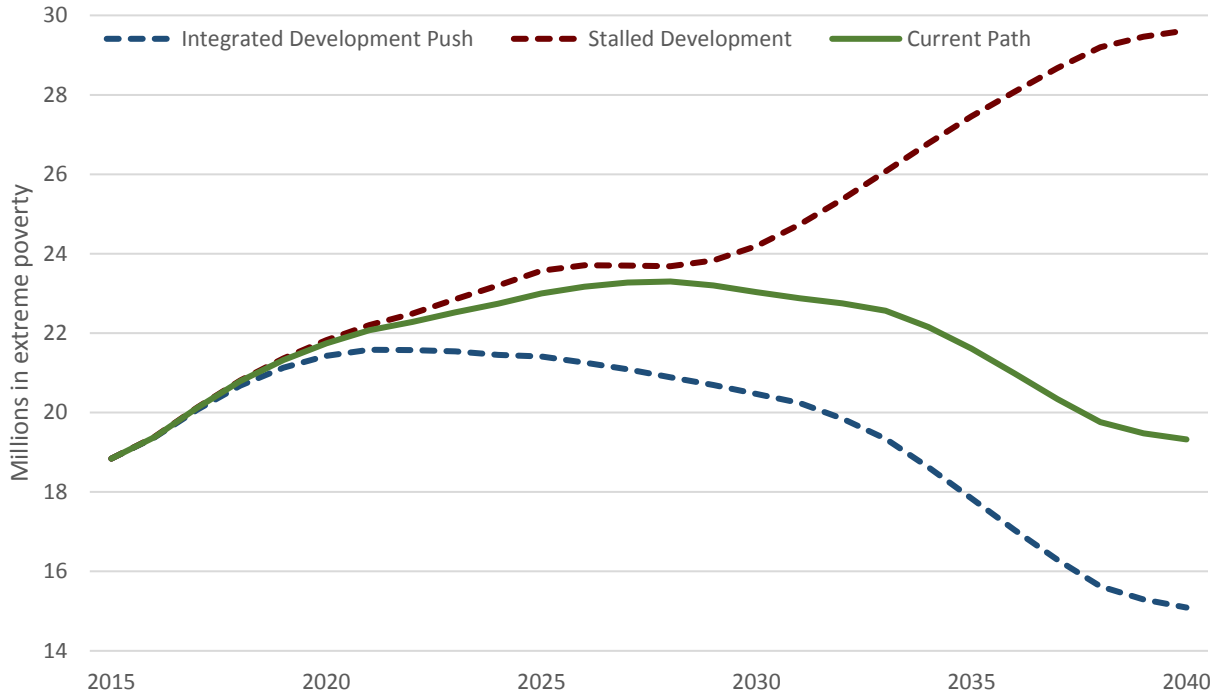
Intervention	Description
Slow Natural Gas Production	In this scenario, initial levels of production (from FLNG and the first onshore trains) remain the same, but ensuing construction and production of onshore trains is significantly delayed.
Decline in Government Capacity	Simulates a continued decline in government effectiveness, an increase in corruption and a reduction in economic freedom.
Stalled human development progress	Simulates slow progress in improving a number of human development outcomes (i.e. education, health, infrastructure)[44]

In the Stalled Development scenario, GDP growth averages only 5.9% between now and 2040. Consequently, GDP output in 2040 is nearly 25% lower than in the Current Path. Further, HDI dips by nearly 3%, the number of those living in extreme poverty increases by over 61%, and the number of hungry people increases by 30%. In other words, if gas production is delayed, government capacity continues to decline and human development progress stalls, the consequences for the poorest and most vulnerable Mozambicans will be immense.

Figure 31 (below) helps to illustrate the impact each of these integrated scenarios have on the poor and most vulnerable in Mozambique. If Mozambique is able to implement an Integrated Development Push, over 4 million fewer people will be in extreme poverty in 2040. Meanwhile, in the Stalled Development scenario, over 11 million more people will be living in extreme poverty by 2040. What's more, it reemphasizes that the Current Path of Mozambican development does little to reduce absolute poverty over the time horizon.

[44] See Annex for details.

Figure 31: Forecast of extreme poverty (five-year moving average), Mozambique (Integrated Push, Stalled Development and Current Path), 2017 to 2040



Source: IFs version 7.28

These two integrated scenarios (along with the Current Path) help frame the range of possible outcomes for the future of Mozambique. If Mozambique can successfully improve human development and ensure timely production and transparent management of natural gas revenues, then the country could set itself on a path toward inclusive growth and development. Whereas, if human development stagnates and natural gas production and management does not go according to plan, the country could fall into a vicious cycle of under-development.

ANNEX

Current Path Adjustments

Current Path adjustments are done to reflect prevailing policy and environmental conditions that are not necessarily reflected in the underlying data. The Current Path adjustments of the variables listed below were created based on research and consultation with issue area experts during two separate consultation meetings in Mozambique.

Figure A.1: Current Path Adjustments

Variable	Adjustment/Reasoning
Bilateral Aid	The forecasted increase in bilateral aid was pared back to reflect donors and stakeholder's feedback. Aid receipts (as a percent of GDP) has been adjusted to reflect a stagnation in bilateral aid over the time horizon.
Government Debt	The recent debt crisis and default was not reflected in the debt data in IFs. It has been adjusted to reflect the current debt to GDP ratio of approximately 130%.
Natural gas production	The natural gas production amount and timeline was adjusted based on research and consultations with industry experts and economists. The Current Path was adjusted to reflect a rapid increase in LNG production in 2024 (from Floating LNG trains) followed by a consistent increase in production from onshore trains from 2024 to 2033.
Total Fertility Rate	The total fertility rate forecast was deemed too aggressive. Mozambique has reduced TFR much more slowly than its peers historically and, given current and continuing conditions, we adjusted the TFR forecast up by about 15% relative to the IFs Base Case.
Female Primary survival	Education experts in Maputo suggested that the rapid increase in female survival in the Current Path was quite aggressive. Historical data shows that female primary survival has remained below male for the past 10 years. Therefore, the female primary survival rate forecast was adjusted downward to track just below the male primary survival rate.
Land under cultivation	Consultation with agricultural experts and further research revealed that forecast for increase in land under cultivation was likely too modest. The Current Path has been adjusted to reflect a steady increase in land under cultivation (15% increase over the IFs Base Case by 2040).
Income Distribution (Gini)	The Current path has been adjusted up from .435 to .47 in 2015 to reflect the latest data data and was adjusted to reflect recent trends in inequality in Mozambique.
Government Effectiveness	The IFs forecast for Government Effectiveness was deemed to be too optimistic (based on historical trends and current conditions). The forecast has been adjusted to continue past trends for five years and level off around 1.7 (five point scale).
Household Welfare Transfers	The household welfare transfers has been adjusted down to about 1.2% of GDP to reflect current levels of government to household welfare transfers.
Road density	The road density forecast was also quite aggressive (based on historical data and current conditions). It has been adjusted down to reflect a more modest increase in total roads over the next 23 years (25% reduction from the IFs Base Case).

Interventions

All interventions were created using IFs version 7.28 and are interpolated from 2018 to 2022 and maintained through 2040 unless otherwise stated.

Figure A.2: Advancing Education

Scenario	Parameter	Target value
Primary Survival	edprisurvm (total)	1.075
Primary Transition	edseclowrstranm	1.075
Lower Secondary Graduation	edseclowrgram	1.1
Secondary Transition	edsecupprtranm	1.075
Upper Secondary Graduation	edsecupprgram	1.065
Tertiary graduation	edtergradm	1.05

Figure A.3: Extending Health and Nutrition

Scenario	Parameter	Target value
AIDS death rate	aidsdratem	0.9
Malaria Mortality	hlmortm	0.75
Improved Sanitation	sanitationm	1.2
Access to Safe Water	watsafem	0.8
Solid Fuel Use	ensolfuelm	0.9
Total mortality	hlmortm	0.975

Figure A.4: Improving Family Planning and Care

Scenario	Parameter	Target value
Family Planning	tfrm	1 (2022), 1.08 (2040)
Contraception use	Contrusm	1.15
Maternal mortality	hlmortcdadltm	0.9
Under 5 Mortality	hlmortmcdchldm	0.9

Figure A.5: Boosting Agricultural Production

Scenario	Parameter	Target value
Yields	ylm	1.22 (2022),1.15 (2040)
Land Under Cult.	ldcropm	2 (2022), 5.5 (2040)

Figure A.6: Strengthening Governance

Scenario	Parameter	Target value
Transparency	govcorruptm	1.1
Government Effectiveness	goveffectm	0.94
Economic Freedom	econfreem	1.1
Gender Empowerment	gemm	1.1

Figure A.7: Household Transfers

Scenario	Parameter	Target
Household Transfers	govhhtrnwelm	1

Figure A.8: Stalled Development

Scenario	Parameter	Target value
Government Effectiveness	goveffectm	0.6
Transparency	govcorruptm	0.875
Gender Empowerment	gemm	0.985
Natural Gas	enpm (gas)	1.8 (2024), 1.4 (2040)

Primary Survival	edprisurm	0.9
Primary Transition	edseclowrstranm	0.96
Lower Secondary Graduation	edseclowrgram	0.94
Secondary Transition	edsecupprtranm	0.985
Upper Secondary Graduation	edsecupprgram	0.95
Tertiary graduation	edtergradm	0.95
Family Planning	tfrm	1.08 (2022), 1.23 (2040)
AIDS death rate	aidsdratem	1.1
Malaria Mortality	hlmortm	1.1
Improved Sanitation	sanitationm	0.85
Access to Safe Water (unimproved)	watsafem	1.15
Solid Fuel Use	ensolfuelm	1.0015
Caloric Availability	clpcm	0.93
Total mortality	hlmortm	1.025
Yields	ylm	0.95

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