ISS INSTITUTE FOR SECURITY STUDIES

FREDERICK S. PARDEE CENTER FOR INTERNATIONAL FUTURES
EXPLORE UNDERSTAND SHAPE

Can natural gas improve Mozambique's development?

Alex Porter, David Bohl, Stellah Kwasi, Zachary Donnenfeld and Jakkie Cilliers

While Mozambique has made economic and development progress over the past 20 years, the country still has some of the lowest levels of human development in the world. The recent discovery of natural gas has generated great optimism for the country's future, but without a concerted effort to invest in basic human development the country will continue to face barriers to inclusive growth.

Key points

- 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.
- Forecast increases in natural gas production should boost economic growth, but the growth is unlikely to translate into absolute poverty reduction.

Purpose

This report uses the International Futures (IFs) forecasting system to analyse 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.

This report is meant to offer a framework in which to think about and evaluate long-term effects and trade-offs 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.

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).

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)

The IFs forecasting system is a dynamic, global model that integrates data and outcomes across development systems. The model holds over 3 500 data series for 186 countries and produces long-term forecasts for hundreds of variables across sectors (i.e. agriculture, education, health, etc.). The model allows us to explore historical trends across time (historical analysis), understand how systems seem to be developing now and into the future (Current Path analysis) and shape how we think about the future through alternative scenario development (scenario 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.

IFs is an open source tool and uses publicly available data from international sources such as the World Bank, World Health Organization, United Nations, etc. Unless otherwise noted, each data reference in this report can be found in the IFs database or documentation.

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. 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 forecasts trends across 186 countries, 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.

For further information on Current Path adjustments and/or data sources in this report please contact Alex Porter at alexandrewporter@gmail.com

Introduction

Mozambique is and has been in a state of chronic under development. Over 65% of the population lives in extreme poverty and most of the country lacks access to basic infrastructure (water, sanitation and electricity). Mozambique has the third lowest education attainment level and one of the lowest life expectancies in the world (173 out 186) and its population suffers from a large communicable disease burden with persistently high AIDS death rates.

Despite these significant challenges, 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 gross primary school enrolment from 66% to 105% and has improved agricultural yields by 50%. Yet the country still lags far behind its global and regional peers (Malawi, Tanzania, Zambia and Zimbabwe)[1] in nearly every aspect of human development.

Mozambique's economic growth and development is not keeping up with its 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, making it more challenging for the Government of Mozambique (GoM) to extend basic services to its people.

> Mozambique has registered about 7% average annual GDP growth in the last 20 years

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 create a virtuous cycle of growth and development. Unfortunately, turning resource revenues into development is notoriously difficult and the country's recent debt crisis has undermined confidence that Mozambique can transparently manage gas revenues for the benefit of all Mozambicans.[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 revenues are invested back into the country, they 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]

Along the Current Path, economic 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. Rapid growth and shift to an energy-intensive economy won't necessarily uplift the poor and most vulnerable. Careful management and investment of revenue into key development sectors is required to ensure that gas production translates into inclusive growth and poverty reduction.

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 increased this number to three trillion cubic meters.[4]

> Rapid growth and a shift to an energy-intensive economy won't necessarily uplift the poor and most vulnerable

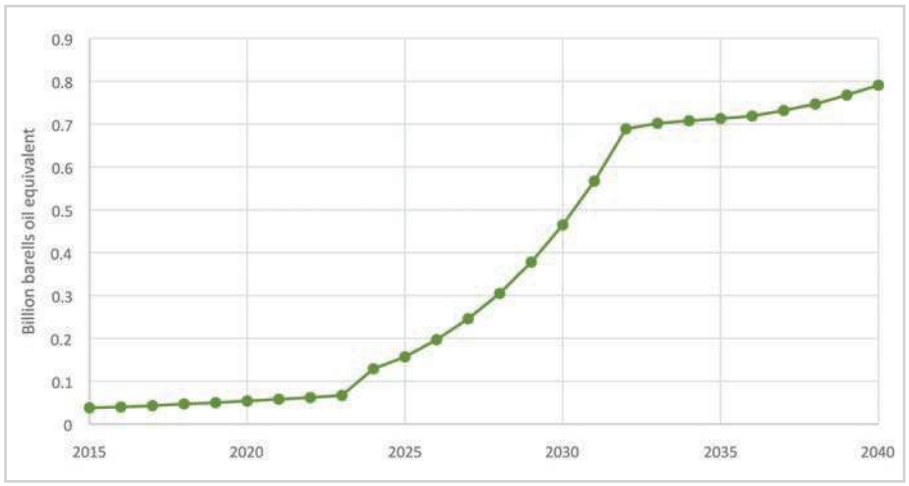
Mozambique currently produces and exports energy from a few smaller natural gas pockets (Pande and Temande fields) in the south of the country.[5] However, optimism around natural gas production and growth revolves around the timeline for construction and production of the larger deposits in the Rovuma 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,[8] with construction and production increasing fairly rapidly as the rest of the planned Floating Liquid Natural Gas (FLNG) and onshore trains come online between 2021 and 2028.[9] However, uncertainty surrounding the sovereign debt crisis and delays in final investment decisions (FIDs) have thrown this timeline into flux.

NATURAL GAS PRODUCTION IS NOT A SILVER BULLET FOR DEVELOPMENT IN MOZAMBIQUE

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 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 is expected to be completed over the subsequent eight years. The Current Path forecasts that Mozambique will produce 53 million barrels of oil equivalent (BOE) (6.3 million

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).

metric tons) by 2020, 460 million BOE (55 million metric tons) by 2030 and 790 million BOE (97 million metric tons) by 2040.

The timeline for gas production is inherently uncertain. Nonetheless, it is important to explore the impacts of this type of rapid production and growth from gas for Mozambique's future development.

Growth

Since 1995, Mozambique has averaged about 7% GDP growth, two percentage points higher than the average for low-income African countries over the same time period.[10] Its growth has also been 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%).

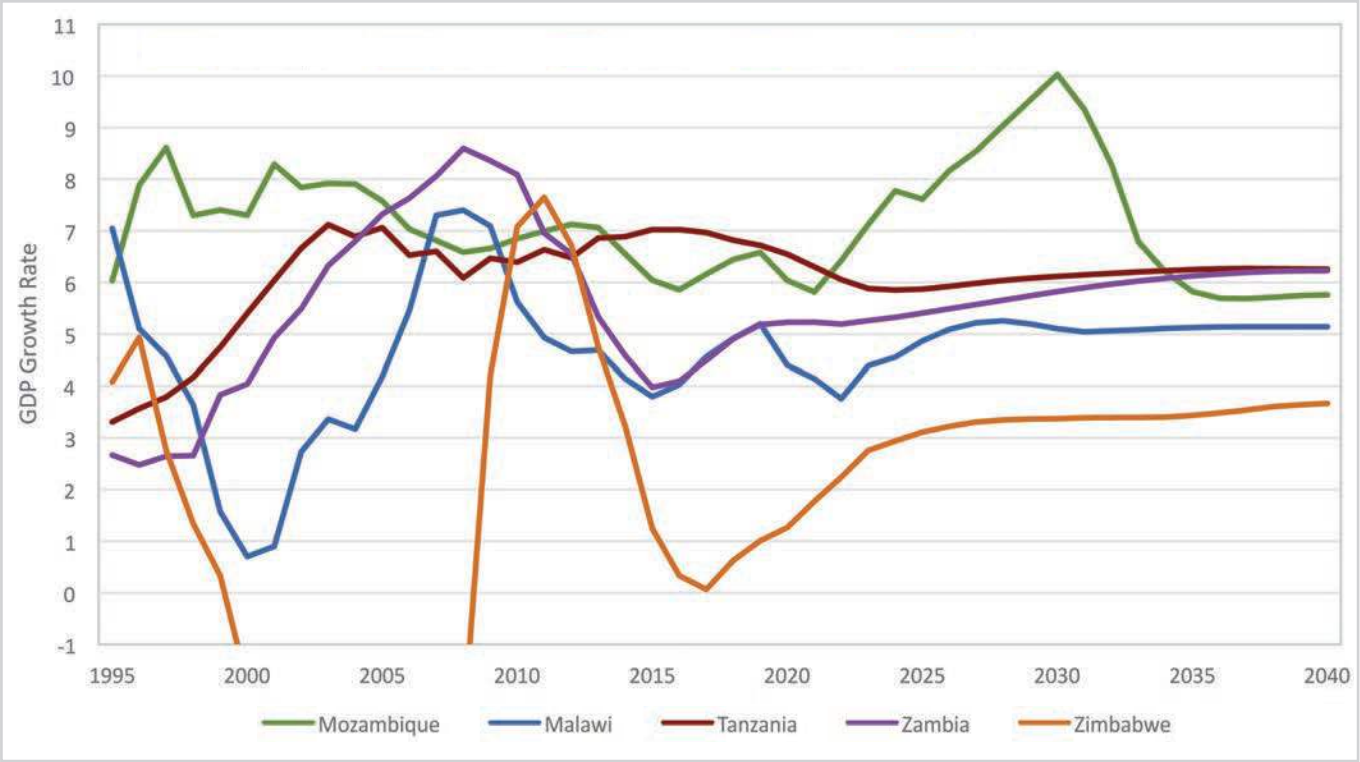
> The Mozambican economy is currently comprised primarily of low value-added services and subsistence agricultural production

In 2016, Mozambique's growth rates dropped to 3.3%. Although the IMF and World Bank have downgraded Mozambique's near-term growth outlook, the country is still forecast to rebound to 6.5% growth by 2018. Looking forward, IFs forecasts that Mozambique will average 9.3% growth between 2024 and 2033 (coinciding with increasing gas production) and will average 7.1% per year over the 23-year horizon.

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 below 14% and agricultural value-added accounts for about 20%. The

MOZAMBIQUE'S GROWTH HAS BEEN HIGHER THAN ANY OF ITS REGIONAL PEERS

Figure 2: GDP growth rates, Mozambique and regional peers, historical and forecast data (1990-2040)



Source: IFs version 7.28, historical data from IMF.

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.

The key question is whether rapid growth and a shift to an energy-intensive economy will ultimately 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.[11] As economic growth becomes more concentrated in extractive industries (i.e. capital intensive), gains are more likely to benefit investors and those with high-level skills than those living in poverty.

Thus the agricultural sector remains 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 by improving access to basic services (i.e. education, health, sanitation) will be necessary to ensure long-term human development and poverty reduction.

Almost

66%

OF MOZAMBICANS LIVE IN EXTREME POVERTY

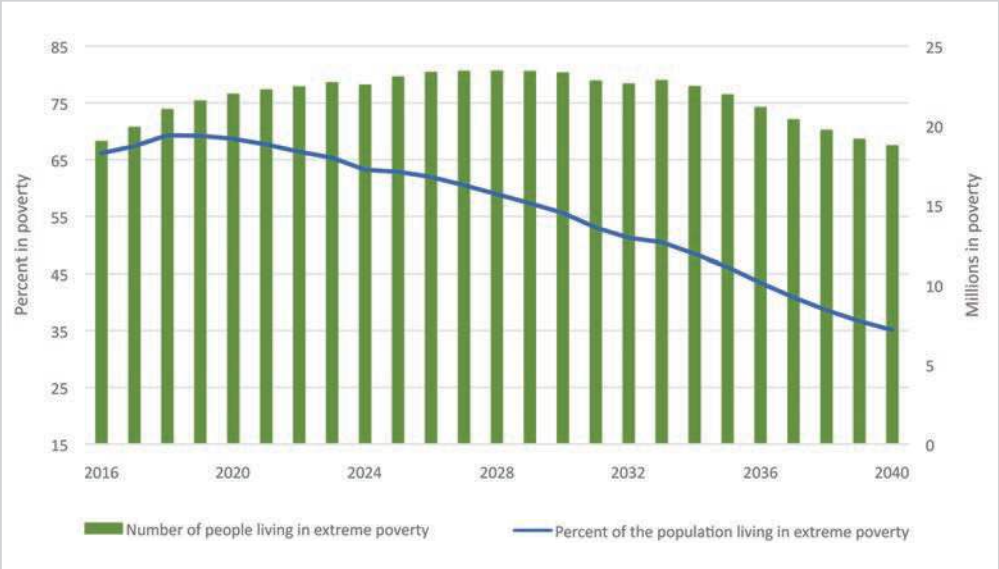
Poverty

Since the end of the civil war in 1992, Mozambique has struggled to ensure that growth and development reaches the poorest and most vulnerable.

Although Mozambique has registered around 7% GDP 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 5 million.

Currently, almost 66% of Mozambique's population is living in extreme poverty (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.

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. The country'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.

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 the HDI,[12] 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.

MOZAMBIQUE RANKS

183

out of

186

GLOBALLY ON THE HUMAN DEVELOPMENT INDEX

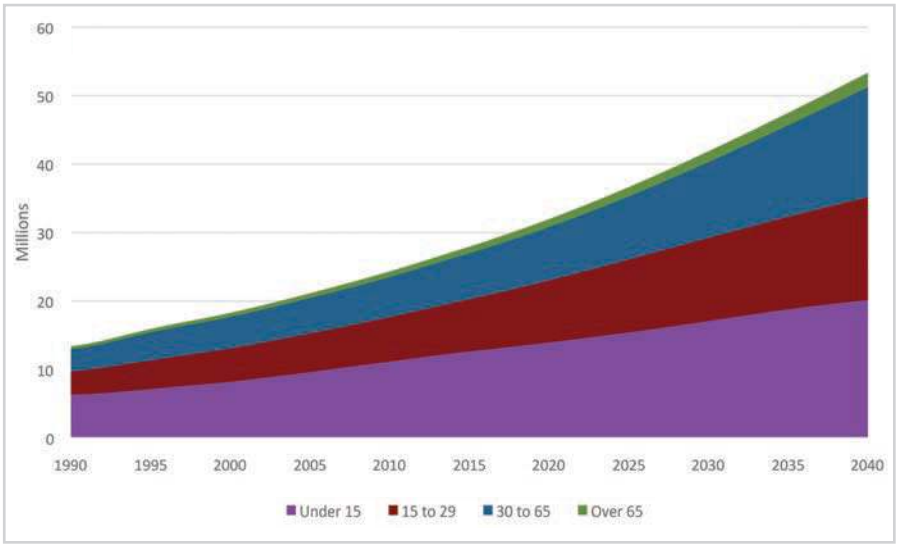
Improving basic human development

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; examine specific challenges associated across demographics, health, education, and agriculture; and outline possible interventions and outcomes in each of these areas.

Demographics

With nearly 29 million people, Mozambique has the 12th largest population in Africa and the 2nd largest in Southern Africa. 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 age, 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).[13] By 2040, the population is forecast to still be amongst the most youthful populations globally; IFs forecasts that 38% of the population will be under the age of 15. Though the country's dependency ratio is expected to fall, it will still be high by both African and world standards (16th highest in Africa; 37th in the world).[14]

This youthfulness means that a relatively small portion of the population must provide for the basic needs of a large segment of the population. High dependency coupled with rapid population growth puts strain on the government's ability to provide basic services, such as the provision of water and sanitation, to the population.

With nearly 29 million people

MOZAMBIQUE HAS THE 12TH LARGEST POPULATION IN AFRICA

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) and 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 low service delivery for this segment of the population.[15]

While the ratio of dependents to working-aged individuals is expected to decline, the absolute number of individuals under 15 is expected to rise to 20 million by 2040 (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. 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.

Barring a major migratory event,[16] the core drivers of population growth are changes 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.[17] It has the lowest life expectancy (57.6 years) in its regional peer group and its gains in life expectancy have progressed slower than the rest of the region over the past 15 years.[18]

MOZAMBIQUE IS FORECAST TO HAVE

53 million people

BY 2040

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

> Slowing Mozambique's rapid population growth could help ease pressures on the government to provide basic goods and services

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 its 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 in the region) and 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 childcare could play a major role in reducing fertility rates.

Scenario analysis: Improving Family Planning and Care

Given the service delivery challenges facing Mozambique, slowing its rapid population growth could help ease pressures on the government and working-aged individuals to provide basic goods and services. In this section, we explore the effects of an Improving 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.

Figure 6: Improving Family Planning and Care interventions

Intervention	Outcome
Improved Family Planning	Reduces fertility rate from 5 to 4.7 between 2017 and 2022.[19]
Increased Contraception Use	Increases contraceptive use from 14% to 22% between 2017 and 2022.[20]
Reduced Maternal Mortality	Reduces the communicable disease mortality for adult women by 19% between 2017 and 2022.[21]
Reduced Under 5 mortality	Reduces the communicable disease mortality for children under five years old from 14.3% in 2017 to 10.3% in 2022.

Only
22%
OF THE ADULT FEMALE POPULATION HAS COMPLETED PRIMARY SCHOOL

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% (2 million person) reduction in total population 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. Further, one million fewer people will need access to improved sanitation and over 1.7 million fewer people will need access to piped water by 2040, relative to the Current Path (See Figure 7 below).

Figure 7: 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, by reducing the number of people in need of health infrastructure and services, Mozambique will be better placed to reduce its heavy communicable disease burden.

THE IMPROVING FAMILY PLANNING AND CARE SCENARIO REDUCES INFANT MORTALITY BY

8%

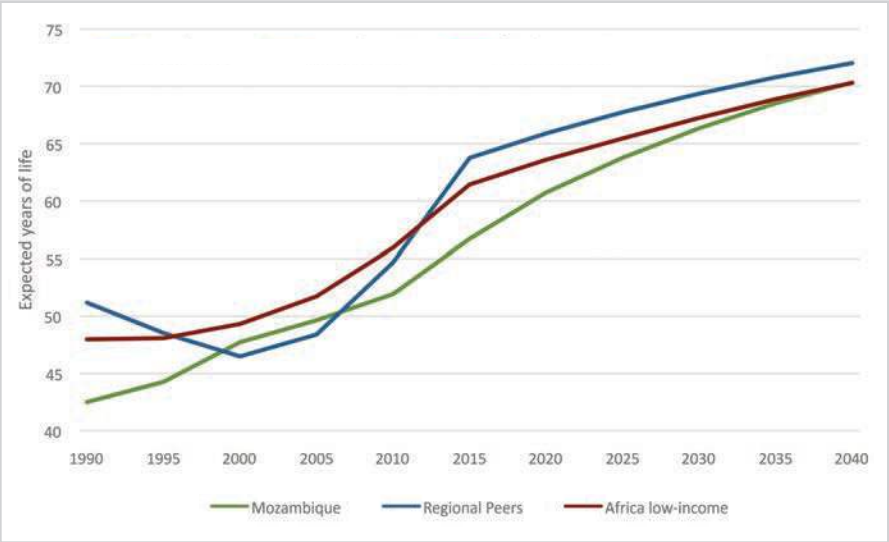
COMPARED TO THE CURRENT PATH SCENARIO IN 2040

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 time but will remain below the low-income African average by 2040.

Figure 8: 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. Though country has made significant progress in decreasing infant mortality over the past 25 years, 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 still has the highest infant mortality rate of its regional peers and currently ranks 19th (out of 54) in Africa. IFs forecasts that Mozambique will continue to 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 is 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).

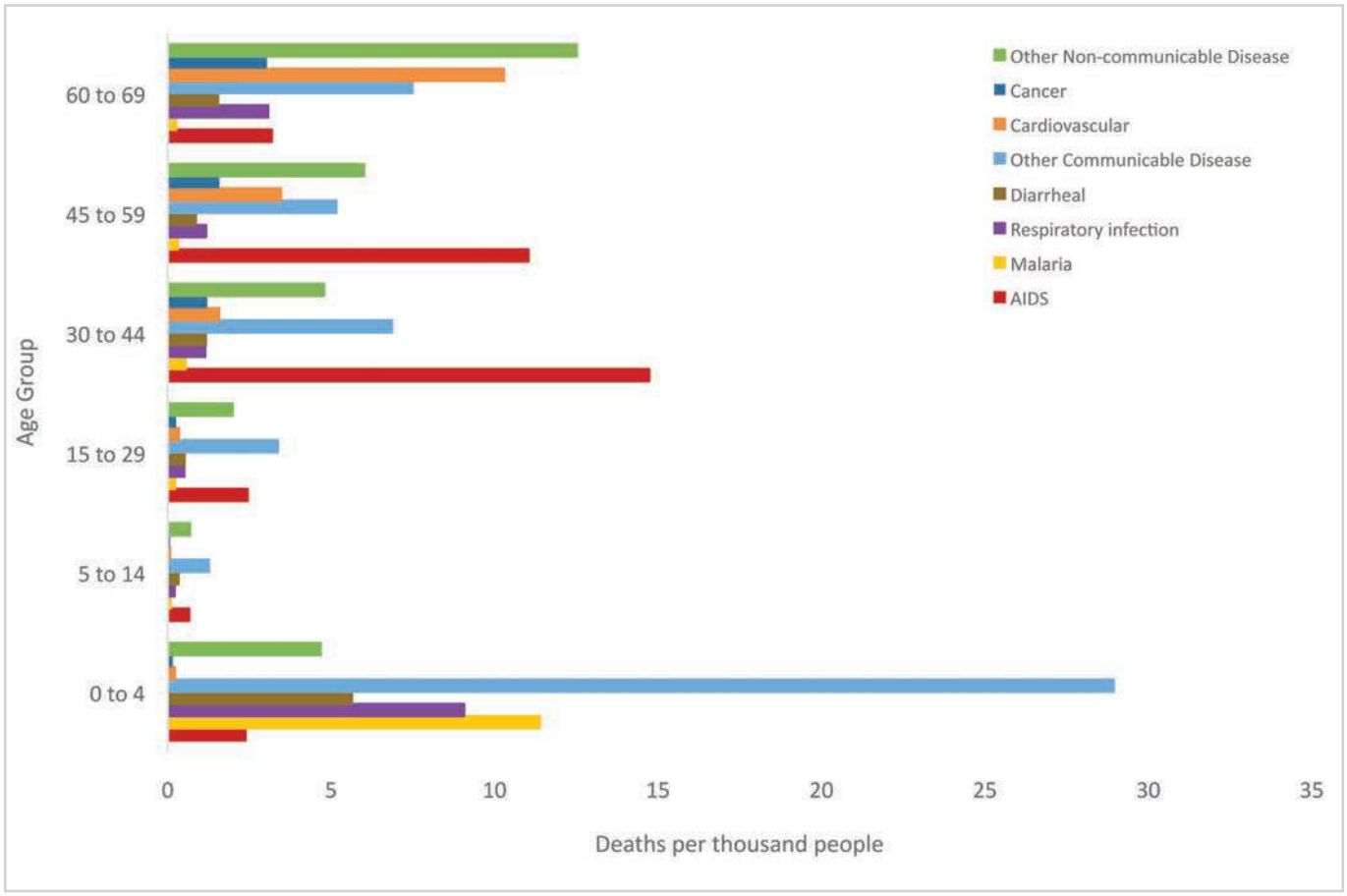
MOZAMBIQUE'S COMMUNICABLE DISEASE DEATH RATE IS ABOUT

6.8

per 1 000 people

The age group 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 is the dominant cause of death. AIDS is by far the largest burden in both the 30 to 44 and 45 to 59 age groups. In the older age group (60-69), the disease burden shifts to non-communicable diseases, such as cardiovascular disease and cancer.

Figure 9: Death rates by age group, 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.[22] Poor water and sanitation access is a core driver of communicable disease deaths (such as diarrhoea) for children under five.

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 five (750 000 children) suffer from undernourishment.[23] Due to high levels of childhood undernourishment, Mozambique also has high levels of stunting. Mozambique's stunting rate (31% 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 limit their ability to work. The country also ranks in the bottom third of Africa in total undernourishment (about 25% of the population is undernourished).[24]

>15%

OF CHILDREN UNDER FIVE SUFFER FROM UNDERNOURISHMENT IN MOZAMBIQUE

While Mozambique had a relatively lower burden and peak of HIV/AIDS in the 1990s to 2000s, the country's HIV/AIDS prevalence and death rates have decreased much slower 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 HIV/AIDS death rates will trail only Zimbabwe's.

> Mozambique should start to invest in horizontal health systems that can treat across disease types as NCDs become more prominent

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, Mozambique's health burden will shift from communicable to non-communicable disease (NCD). This transition 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 programmes. 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.

Scenario analysis: Extending Health and Nutrition

The Extending Health and Nutrition scenario simulates the successful implementation of a set of interventions that aim to reduce the burden of the most prevalent diseases in Mozambique while improving overall health infrastructure and access. 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 health systems. Figure 10 provides additional detail regarding the interventions found within the Extending Health and Nutrition scenario.

The Extending Health and Nutrition scenario decreases total disability-adjusted life years (DALYs)[25] lost from communicable disease by nearly 9% compared to the Current Path in 2040. It also reduces infant mortality by 8% and reduces the number of undernourished children by more than 138 000 as compared with the Current Path in 2040.

The HIV/AIDS Mitigation, Reducing Malaria and Horizontal Health interventions have the largest individual impacts on life expectancy and overall morbidity and mortality, as measured by DALYs. The HIV/AIDS Mitigation

MOZAMBIQUE HAD A RELATIVELY LOWER BURDEN AND PEAK OF

HIV/AIDS

IN THE

1990s to 2000s

Figure 10: Extending Health and Nutrition interventions

Intervention	Outcome
HIV/AIDS Mitigation	Reduces AIDS death rate by 30% between 2017 and 2022.[26]
Reducing Malaria	Reduces the number of malaria deaths by 30% between 2017 and 2022.[27]
Improved Sanitation	Increases access to improved sanitation facilities from 22% to 31% between 2017 and 2022.[28]
Access to Safe Water	Increases access to safe water sources from 52% to 59% between 2017 and 2022.[29]
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.[30]
Caloric Availability	Increases effective demand from 2 200 calories to 2 500 calories between 2017 and 2022.[31]
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).

scenario reduces the AIDS death rate by 11% compared to the Current Path.[32] Meanwhile, the Reducing Malaria intervention averts a total of 48 000 malaria deaths by 2040 relative to the Current Path.

The Improved Sanitation, Caloric Availability and Horizontal Health 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.

> The Improved Sanitation, Caloric Availability and Horizontal Health scenarios all have a large impact on infant mortality

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.

THE IMPROVED SANITATION SCENARIO RESULTS IN A CUMULATIVE

US$5.3 billion

INCREASE IN GDP RELATIVE TO THE CURRENT PATH SCENARIO IN 2040

Figure 11: 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 11 above provides greater detail regarding the impact of each intervention and illustrates some of the trade-offs associated with pursuing one set of sectoral policies over another. For example, without programmes aimed at extending access to food, safe water or improved sanitation, an intervention that reduces deaths from HIV/AIDS is likely to increase the number of children and adults suffering from undernutrition. These trade-offs are particularly evident in health systems, where reducing the burden of one disease may increase the burden of another.

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 may be beneficial for cognitive abilities, which, combined with improvements in education, could improve productivity and decrease poverty in the long run.

Education

Education systems can best be thought of as a pipeline. Children start at the beginning (primary enrolment) 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.[33] 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.

Mozambique's educational attainment is one of the lowest in the world. Its average years of education (for adults 15 and older) is 2.5 years, which ranks

ONLY ABOUT 50% OF MOZAMBIQUE'S ADULT POPULATION IS LITERATE

Figure 12: Education flow rates,[34] Mozambique, 2016

	Primary		Lower Secondary		Upper Secondary		Tertiary	
	Enrol (gross)	Survival	Enrol (net)	Survival	Enrol (net)	Survival	Enrol (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.

52nd in Africa (out of 54) and 184th globally (out of 186). Only about 50% of the adult population is literate, less than 30% of adults have completed primary school and only 5% of adults have completed secondary education.

While primary school enrolment rates in Mozambique stand at 88% (net) and 105% (gross), 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.[35] Early marriage for girls also often prevents female students from completing primary school.[36] 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.

> Mozambique's primary school survival rate is 37.5%, which is only ahead of Somalia in global rankings

There is also a significant bottleneck 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. As a result, very few students move to upper secondary education and even fewer continue to tertiary education.

IFs forecasts that primary survival, secondary enrolment and completion rates will rise over the next 23 years. While the primary survival rate and secondary enrolment rate (net) are forecast to double by 2040, millions of children will miss out on a full education in the intervening years. By 2040, the IFs Current

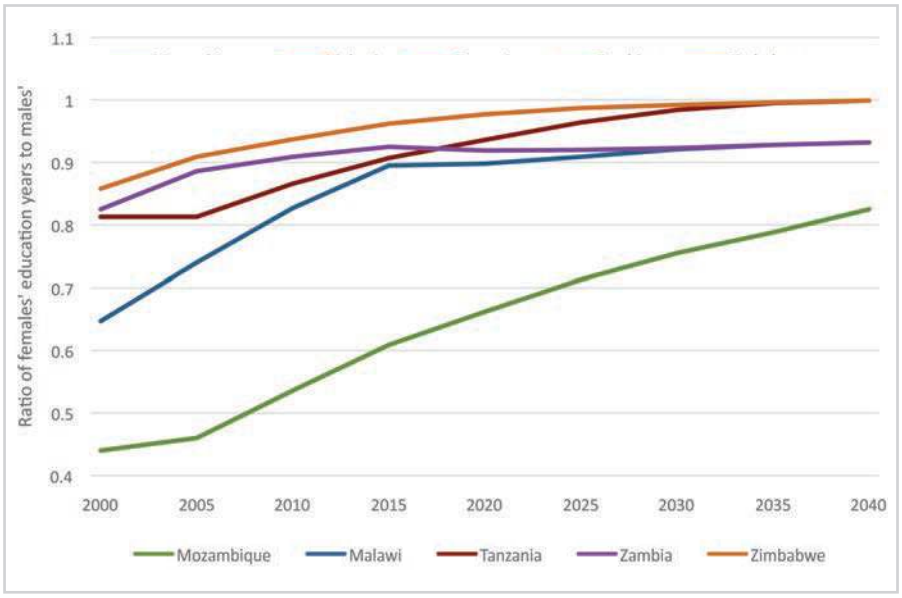
2.5 years

MOZAMBIQUE'S AVERAGE YEARS OF EDUCATION FOR ADULTS 15 AND OLDER

Path suggests that only 60% of adults will have completed primary education and only 17% of adults will have completed secondary education.

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 enrolment and survival; only 86% of school aged females enrol 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 13: Gender Parity (mean education years), 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 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. Female education is important for a myriad of reasons and there is a link between 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 women and children.

MOZAMBIQUE RANKS

50th

IN AFRICA ON GENDER PARITY

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 six separate interventions that represent a five-year push to improved outcomes at various stages along the education pipeline.

Figure 14: The Advancing Education interventions

Intervention	Outcome
Improving Primary Survival	Increases the number of enrolled primary school students who make it to the last grade of primary school from 39% in 2017 to 53% in 2022.[37]
Increasing Lower Secondary Enrolment	Increases the ratio of primary graduates that enrol to secondary school from 71% in 2017 to 80% in 2022.[38]
Increasing Lower Secondary Graduation	Increases the number of students enrolled in lower secondary school who graduate from 24% in 2017 to 30% in 2022.[39]
Increasing Upper Secondary Enrolment	Increases the number of lower secondary graduates who move on to enrol in upper secondary school from 70% in 2017 to 76% in 2022.[40]
Increasing Upper Secondary Graduation	Increases the number of students enrolled in upper secondary school who graduate from 16% in 2017 to 21% in 2022.[41]
Boosting Tertiary Graduation	Increases tertiary graduation from 1.5% in 2017 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 will have completed primary school by 2040. The Advancing Education scenario also increases the number of students who enrol and complete secondary school. By 2040, nearly 84% of age appropriate students enrol 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). Thus, by 2040, nearly 550 000 more Mozambicans will have completed secondary education.

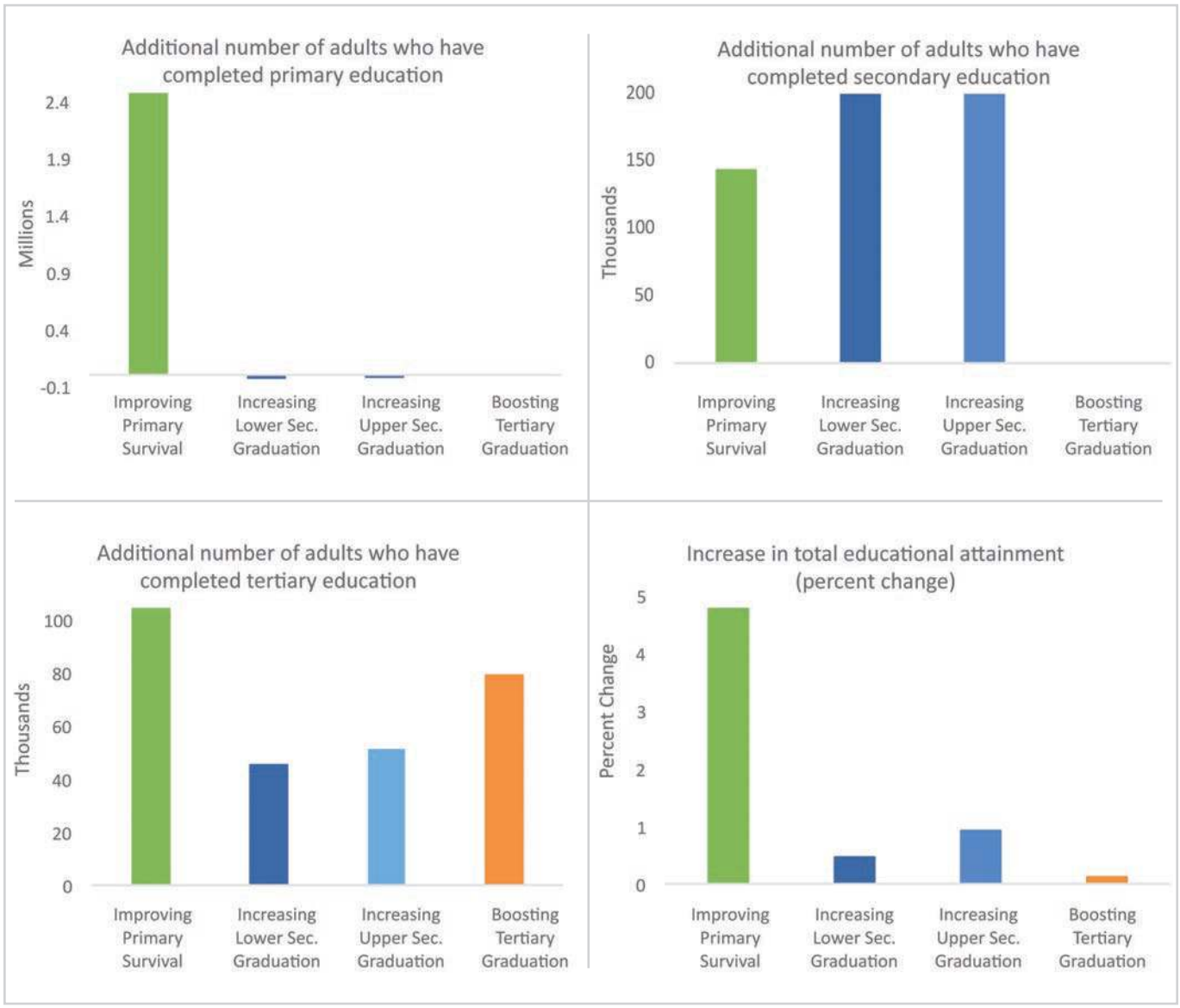
The Improving Primary Survival intervention drives improvements across a number of broader education indicators. Improving Primary Survival provides the largest boost to overall educational attainment and has a significant impact on the transition rates into secondary school, secondary graduation and enrolment in tertiary education compared to the other individual interventions. In fact, the Improving Primary Survival intervention has the largest effect on both primary and tertiary completion rates (see Figure 15). This is because improvements at lower levels of education increase the total number of students eligible to move through secondary and tertiary education.

BY 2040, NEARLY

550 000

MORE MOZAMBICANS WILL HAVE COMPLETED SECONDARY EDUCATION IN THE ADVANCING EDUCATION SCENARIO

Figure 15: 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.

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.[42]

Agriculture

Though the agricultural sector accounts for only a quarter of economic production, it is an integral part of both the Mozambican economy and society.

In 2014, 72% of the labour force was engaged in agriculture, which means that most individuals in Mozambique rely on agriculture as a means of income or subsistence.[43] Like many other low-income African countries, Mozambique's agricultural sector is dominated by small-scale subsistence farming – 3.2 million smallholder farmers account for 95% of total agricultural production.[44]

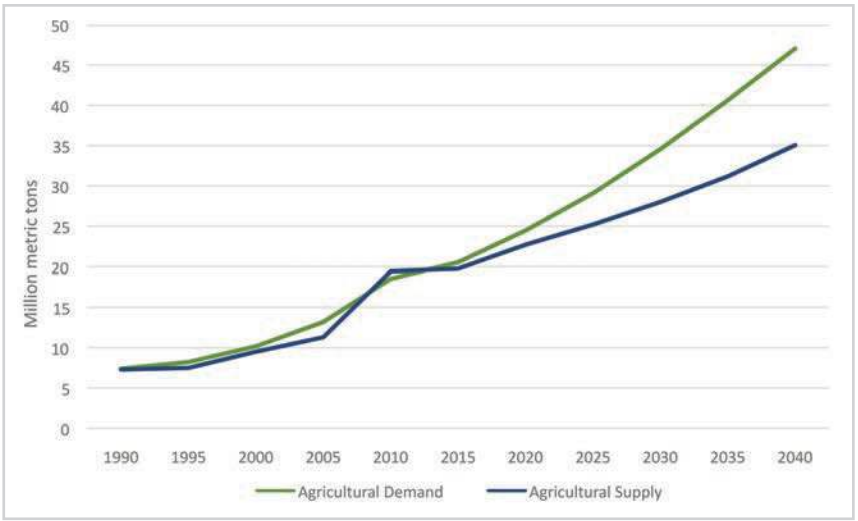
Mozambique has nearly tripled its total agricultural output over the past 20 years, from 7 million metric tons in 1995 to nearly 21 million metric tons in 2011.[45] This increase in total production is due to a combination of increases in land under cultivation and increases in yield. Since 1995, the 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.

> Mozambique has nearly tripled its total agricultural output over the past 20 years, due to increases in land under cultivation and increases in yield

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.[46] However, as Mozambique develops, individuals will be able to consume more and food preferences will likely 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.

Figure 16: Agricultural demand and supply, Mozambique, history and forecast (1990 to 2040)



Source: IFs version 7.28, historical data from UIS.

In 2014,
72%
OF THE LABOUR FORCE WAS ENGAGED IN AGRICULTURE

As food demand outpaces supply, Mozambique will need to meet demand by importing food. 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. As reliance on imports for food increases, so does the risk that the country could be affected by external food price shocks and exchange rate volatility.

In addition, expected increases in temperature and changed in rainfall from climate change will likely have negative effects on agricultural production and resilience.[47] This is especially true for subsistence and smallholder farmers who are the most affected by changes in precipitation. 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),[48] can both have devastating effects on subsistence agriculture.

Scenario analysis: Boosting Agricultural Production

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

Figure 17: Boosting Agricultural Production interventions

Intervention	Outcome
Increasing Crop Yields	Increases agricultural yield from 3.7 metric tons per hectare to 4.7 metrics tons per hectare between 2017 and 2022.[49]
Expanding Land Under Cultivation	Increases crop land under cultivation from 6.1 million hectares to 6.8 million hectares between 2017 and 2022.[50]

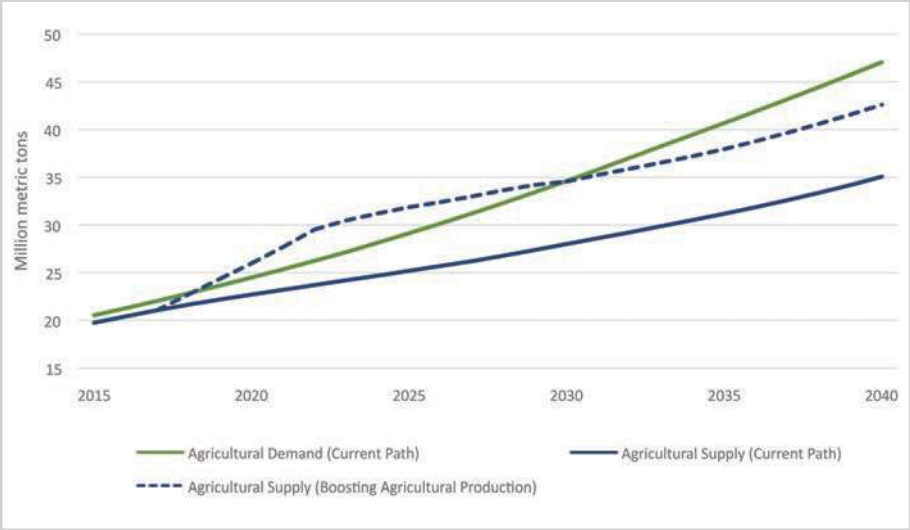
The Boosting Agricultural Production scenario increases total crop production by 22% (7.5 MMT) compared to the Current Path in 2040.[51] This results in a three-fold increase in Mozambique's crop exports by 2040 relative to the Current Path and narrows the gap between domestic production and demand (see Figure 18).

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 (compared with the Current Path forecast).

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 would be sold on the global market. Similarly, any policy

DROUGHTS AND SEVERE FLOODING HAVE DEVASTATING EFFECTS ON SUBSISTENCE AGRICULTURE IN MOZAMBIQUE

Figure 18: Agricultural demand and supply, Mozambique (Current Path and Boosting Agricultural Production scenario), forecast (2015 to 2040)



Source: IFs version 7.28, historical data from FAO.

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, not only to ensure hunger reduction and food security, but also to set a path towards long-term sustainable development across all sectors.

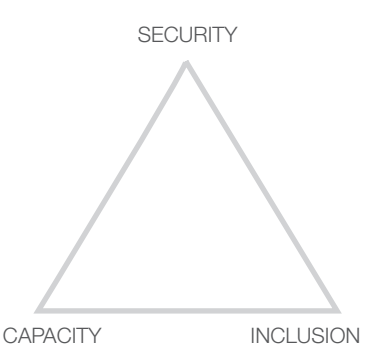
Transforming growth into development

The ability of the government to protect its citizens, provide basic services and foster social inclusivity underlies any long-term development strategy. IFs conceptualises governance across three dimensions: security, capacity and inclusion. These dimensions are based on historical development of governance and have traditionally occurred in order (security to capacity to inclusion), but they are all heavily inter-connected and do not necessarily occur sequentially.[52]

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 conceptualised 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 still low in 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

ELEMENTS OF GOVERNANCE



and growing youth bulge alongside the recent increase in political violence (following the disputed 2014 elections) heightens the risk of conflict going forward.

Although levels of government capacity[53] and effectiveness[54] 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. Further, government effectiveness has declined over the past 20 years and government revenues are heavily dependent on waning donor assistance. In this context, an 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 or even accelerating the downward trend in governance indicators.

> Mozambique's ability to provide basic services has lagged far behind the needs of its population and government effectiveness has declined

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.

Government capacity

Capacity can be thought of as the ability for governments to raise and efficiently deploy revenue towards public goods, services, and systems.[55] In this sense, revenue generation increases capacity, whereas corruption undermines it.[56] At first glance, Mozambique's capacity appears on par with other countries on the continent. Its total revenue to GDP ratio stands at nearly 40%, which is significantly higher than the average of its regional peers and other low-income African countries. It ranks in the middle on most governance indicators within Africa (though it ranks in the lower third globally).

MOZAMBIQUE IS HEAVILY RELIANT ON OVERSEAS DEVELOPMENT ASSISTANCE TO FINANCE ITS DEVELOPMENT

Figure 19: Government capacity indicators, Mozambique, 2016

	African Rank (out of 54)	World Rank (out of 186)
Transparency Index (corruption)	29	129[57]
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 downward for the past 20 years and, while transparency has been slowly improving, the recent debt scandal has called those improvements into question.[58] 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 Mozambique's GDP. In 2016, this dropped to 10%, but foreign aid still made up over a quarter of total government revenue. Moreover, donors have provided extensive General Budget Support to help the government fund poverty alleviation and development programmes.[59] 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.

The possible influx of revenues from gas production further complicates this picture moving forward. In one sense, the windfalls from gas extraction could help relieve Mozambique's dependence on donors. 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.[60]

The Government of Mozambique will need to balance debt repayment and restructuring with the cost of providing public services

The undisclosed debt, plus a sharp devaluation of the metical, pushed Mozambique's largely dollar-denominated debt to unsustainable levels, with the debt-to-GDP ratio reaching nearly 130%. As a result, the IMF suspended its programme and donors have suspended General Budget Support. Looking forward, bilateral aid is expected to average about US$2.1 billion per year over the next 23 years.[61] By 2040, aid as a portion of GDP is expected to fall from 10.5% now to just over 2% of GDP in 2040.

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.[62] The GoM will need to balance debt repayment and restructuring with the cost of providing education, health, and other public services.

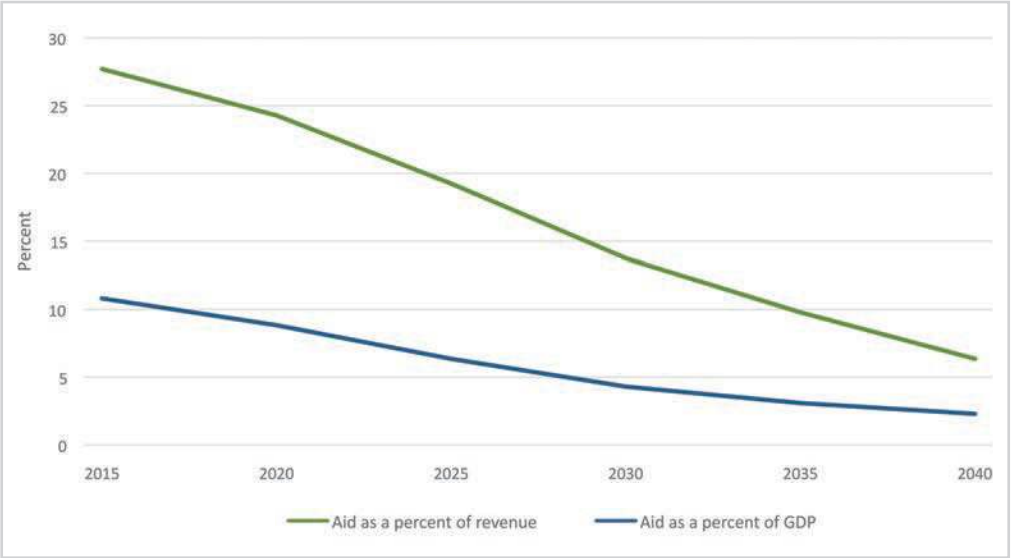
Risks highlighted by the current debt crisis, paired with reliance on waning external assistance and downward trends in government effectiveness, suggest that the GoM may have difficulty improving capacity and service

BILATERAL AID TO MOZAMBIQUE IS EXPECTED TO AVERAGE ABOUT

US$2.1 billion

PER YEAR OVER THE NEXT 23 YEARS

Figure 20: Aid receipts, Mozambique, forecast (2015 to 2040)



Source: IFs version 7.28.

delivery in the lead up to gas production. Steps have been taken to ensure transparency, but even if Mozambique is able to minimise resource rent seeking, it will need to improve its ability to funnel revenues toward programmes that further human and economic development.

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 21: Strengthening Governance Interventions

Intervention	Outcome
Improving Transparency	Increases government transparency from 3.1 to 3.4 between 2017 and 2022.[63]
Increasing Government Effectiveness	Improves Government Effectiveness from 1.7 to 1.9 between 2017 and 2022.[64]
Expanding Economic Freedom	Improves economic freedom from 5.9 to 6.6 between 2017 and 2022.[65]
Increasing Gender Empowerment	Improves gender empowerment from .35 to .38 between 2017 and 2022.[66]

THE STRENGTHENING GOVERNANCE SCENARIO REDUCES THE NUMBER OF MOZAMBICANS SURVIVING ON LESS THAN US$1.90 PER DAY BY NEARLY

1.3 million

COMPARED TO THE CURRENT PATH SCENARIO IN 2040

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 (Current

Path forecast) 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.

Comparing outcomes and framing uncertainty

Sectoral scenarios: outcomes and trade-offs

This section brings together the scenarios and analysis from the previous sections to help frame outcomes and trade-offs 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 22: Summary of sectoral scenarios

Intervention	Description
Advancing Education	Aims to widen bottlenecks and increase overall educational attainment, through six interventions run along the education pipeline.
Extending Health and Nutrition	Aims to increase water and sanitation access, reduce indoor air pollution, extend communicable disease prevention and treatment (with particular focus on HIV/AIDS and malaria), increase access to calories and strengthen horizontal health systems.
Strengthening Governance	Aims to increase transparency and government effectiveness and enhance economic and social inclusion.
Improving Family Planning and Care	Aims to slow population growth by extending access to contraception and family planning services and aims to reduce the health risks associated with pregnancy, births, and infancy.
Boosting Agricultural Production	Aims to increase domestic crop production through the successful implementation of programmes aimed at increasing crop yields and expanding land under cultivation.

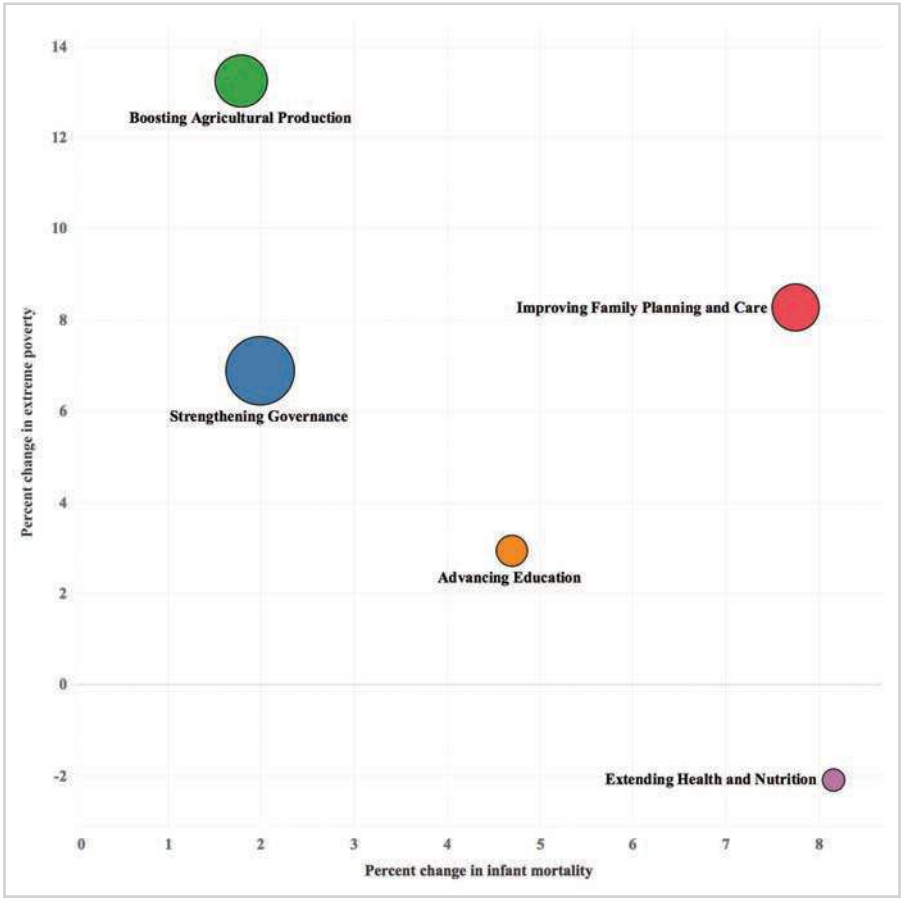
THE IMPROVING GOVERNMENT EFFECTIVENESS SCENARIO CREATES A

3.5%

REDUCTION IN POVERTY RELATIVE TO THE CURRENT PATH SCENARIO

Figure 23 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).

Figure 23: 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)

COMPARED TO THE CURRENT PATH SCENARIO IN 2040

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

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

The Strengthening Governance scenario registers by far the largest increase in GDP (8% increase) and GDP per capita (5% increase) in 2040. 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 fewer people utilising the same resources, but it also translates to a small labour force and less total output.

In the Improving Family Planning and Care scenario, there is a trade-off between population and total GDP output, but every sectoral scenario and intervention also has either implicit or explicit trade-offs. Therefore, it is important to examine both the positive outcomes and trade-offs across sectors. Figure 24 below outlines the benefits and trade-offs 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).

Extending Health and Nutrition reduces the disease burden currently plaguing Mozambique and improves the lives of those once afflicted. However, without

Figure 24: 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.

other programmes 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 programmes it does little to improve life expectancy. Finally the Advancing Education scenario has a large impact on educational attainment and HDI, but because improvements in education manifest over long time horizons it has a modest effect on overall GDP by 2040.

While each of these sectoral scenarios has benefits and trade-offs across development sectors, an integrated development strategy can help mitigate these trade-offs 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.

Framing uncertainty: Integrated Development scenarios

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

> An integrated development strategy can help mitigate trade-offs and push Mozambique towards inclusive growth and development

The Integrated Development Push combines each of the sectoral scenarios outlined in this report to represent a five-year push to improve economic, human, and social development in Mozambique. This demonstrates the value of pursuing an integrated development strategy across all sectors. Figure 25 shows the effects of the Integrated Development Push on extreme poverty, infant mortality and GDP per capita (compared to the Current Path in 2040).

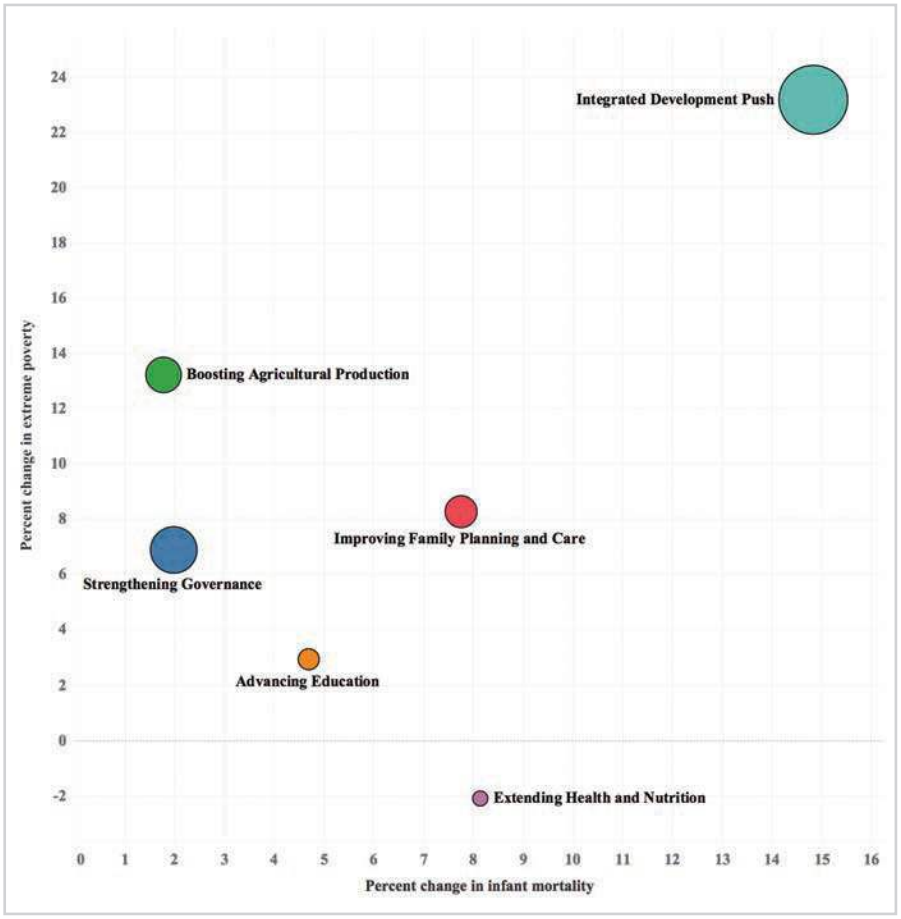
The Integrated Development Push scenario demonstrates that a positive policy push across these sectors will significantly improve Mozambique's HDI, curb high population growth and contribute to poverty reduction and economic growth. In this scenario, economic growth averages 7.7% per year out to 2040 (compared to 7.1% in the Current Path). This results in a 14% increase in GDP by 2040 and a US$113 billion cumulative increase in GDP 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.

THE NUMBER OF UNDERNOURISHED CHILDREN DROPS BY A STAGGERING

35%

IN THE INTEGRATED DEVELOPMENT PUSH SCENARIO COMPARED TO THE CURRENT PATH SCENARIO

Figure 25: Impacts of sectoral scenarios on selected development indicators (relative to the Current Path), 2040



Source: IFs version 7.28.

Conversely, the Stalled Development Scenario simulates stagnation across human, social and economic sectors, along with delays in the expected gas production and a decline in government capacity.

Figure 26: Stalled Development interventions

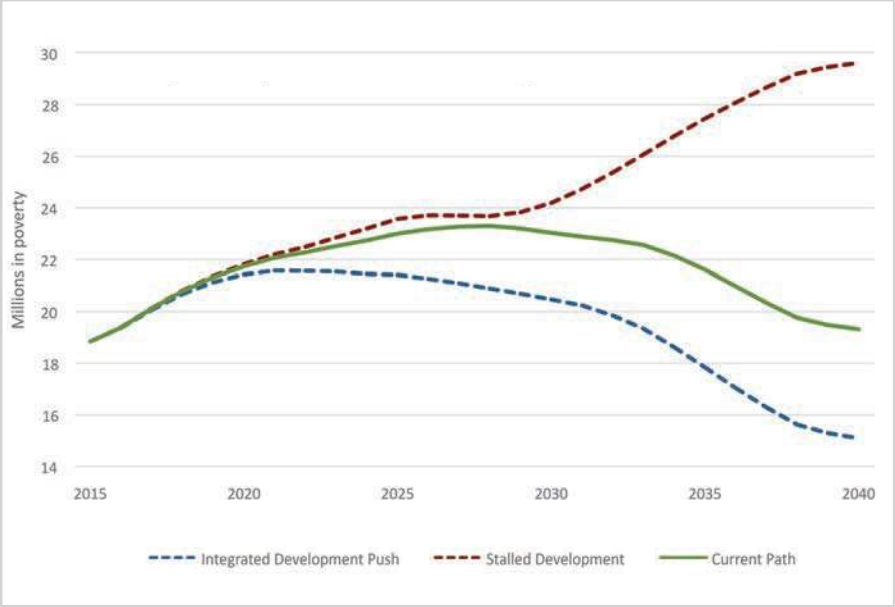
Intervention	Description
Slow natural gas production	Initial levels of production (from FLNG and the first onshore trains) remain the same, but ensuing construction and production of onshore trains is significantly delayed.
Decline in government capacity	Simulates a continued decline in government effectiveness, 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)[66]

THE CONSEQUENCES FOR THE POOREST AND MOST VULNERABLE MOZAMBICANS WILL BE IMMENSE IF DEVELOPMENT PROGRESS STALLS

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 27 (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, 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 reemphasises that the Current Path of Mozambican development does little to reduce absolute poverty over the time horizon.

Figure 27: Forecast of extreme poverty,[67] Mozambique (Integrated Push, Stalled Development and Current Path), 2017 to 2040



Source: IFs version 7.28.

IF MOZAMBIQUE IMPLEMENTS THE INTEGRATED DEVELOPMENT PUSH SCENARIO,

4 million fewer people

PEOPLE WILL BE IN EXTREME POVERTY IN 2040

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.

Moving forward

The discovery of natural gas in Mozambique has injected a healthy dose of optimism into discussions around the country's future. But natural gas growth alone is unlikely to solve Mozambique's long-term growth and development issues. Natural-gas production is forecast to drive significant economic growth in the coming years, but there is much uncertainty about how those funds will be used to further human development and inclusive growth.

This report has identified several areas of human development where Mozambique lags behind regional and income peers. It also shows the possible effects of various five-year policy interventions in those core areas. Based on the findings of this research, the government of Mozambique and development partners should strive to:

- Improve family planning and care. Mozambique's young and rapidly growing population will complicate efforts to accelerate service delivery going forward. Improving family planning (and child and maternal care) will help to reduce this strain and put the country on a more sustainable population growth path.
- Strengthen governance. Mozambique will need to improve government effectiveness and capacity to ensure both the careful management of gas revenues and reinvestment into human development.
- Increase primary education survival rates. Mozambique has the second lowest primary education survival rate in the world – only 40% of the students who enter primary school make it to the final grade. Improving primary survival rates will increase attainment across all educational levels by increasing the absolute number of children with basic education.
- Boost agricultural production. Given the importance of the agricultural sector to employment, food security and economic livelihood, increasing domestic production will have positive long-term effects on poverty and food import dependence.
- Extend health services and infrastructure. Mozambique has a large communicable disease burden, especially in infants and children under five. Extending health infrastructure, increasing antiretroviral access, and extending malaria testing and prevention services will help reduce this burden.

Without a concerted effort to improve government capabilities and invest in human development, it will be difficult for Mozambique to ensure long-term inclusive growth and development regardless of the outcome of natural-gas production. Rapid population growth, rising inequality and lack of access to basic services mean that growth is unlikely to trickle down to the poorest Mozambicans. Even with a significant increase in gas production and growth, the number of people living in extreme poverty is forecast to be nearly the same in 2040 as it is today.

The consequences of missteps in natural-gas management and the stagnation of human development progress could be devastating for the poorest and most vulnerable Mozambicans. If natural gas is delayed, the government fails to improve transparency and effectiveness and human development stalls, there could be over 11 million more Mozambicans living in extreme poverty by 2040.

If the government of Mozambique and international donors can implement an integrated policy push across the development sectors outlined above, it could reduce the number of those living in extreme poverty by four million. This will place the country on a path toward inclusive growth and sustainable development.

Notes

The authors would like to thank all those at Irish Aid, the Government of Mozambique's Ministry of Economy and Finance and all local and international issue area experts who provided guidance and feedback throughout the process. Specifically, the authors would like to thank Irish Aid's Caroline Ennis and Vasco Nhabinde, National Director of Economic and Finance Studies for the Government of Mozambique, for their invaluable guidance and support throughout the consultation and research process.

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

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

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

4 This translates into about 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 One Floating Liquid Natural Gas (FLNG) and two onshore trains.

9 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.)

10 Low-income African economies as defined by the World Bank based on GDP per capita.

11 N Barma et al, Rents to riches? : The political economy of natural resource-led development, *World Bank*, 2012.

12 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.

13 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).

14 Note that high dependency ratios in the developed world manifest as a higher ratio of over-65 individuals rather than under-15.

15 H Urdal, The Devil in the Demographics: The Effect of Youth Bulges on Domestic Armed Conflict, 1950-2000, *Social Development Papers*, 14, June 2004, 2,4.

16 The Mozambican civil war caused a massive out-migration between the late 1970s and early 1990s and subsequent in-migration through the mid-1990s. This migratory event had large effects on the population growth rate over those two decades.

17 As measured by GDP per capita.

18 Causes of this relatively low life expectancy are explored further in the health section of this report.

19 Malawi and Botswana have achieved similar total fertility rate reductions in the past.

20 Malawi has achieved similar increases in contraceptive use.

21 Botswana achieved an even greater increase between 2000 and 2005.

22 Mozambique Situational analysis – Malaria, *WHO country profiles*, www.afro.who.int/index.php?option=com_content&view=article&id=3136&Itemid=2867

23 Childhood undernutrition is a function of food availability and communicable disease prevalence early in life.

24 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.

25 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/

26 Namibia achieved a 43% decrease in AIDS deaths between 2006 and 2011.

27 Between 2005 and 2010 Mali, Nigeria and Angola achieved at least 30%, 31% and 36% reduction in malaria deaths, respectively. WHO, Estimated Deaths, Estimates by country, http://apps.who.int/gho/data/view.main.14119?lang=en

28 Angola increased sanitation access from 23.5% to 29.4% between 1993 and 1998.

29 Malawi achieved over 10% increase between 1990 and 1995.

30 Angola achieved a 15% reduction between 1996 and 2001.

31 Angola achieved 16% increase between 2000 and 2005

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

33 J Dickson, B Hughes, M Irfan, Patterns of Potential Human Progress, *Advancing Global Education*, Paradigm, Oxford University Press, Boulder, 2010)

34 Net enrolment rate is expressed as a per cent 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 per cent (which means that gross enrolment can and is often higher than 100%). Primary survival rate is the per cent of children enrolled in primary school who make to the final grade

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

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

37 Malawi achieved a similar increase between 2005 and 2010.

38 Lesotho achieved an even higher increase in transition rates from primary to lower secondary between 2000 and 2005.

39 Similar increases have been achieved in Lesotho between 2006 and 2013.

40 Lesotho and Zambia achieved even higher increases between 2000 and 2005.

41 Swaziland achieved a similar increase between 2005 and 2010.

42 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

43 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

44 Food and Agriculture Organization, Mozambique at a glance, www.fao.org/mozambique/fao-in-mozambique/mozambique-at-a-glance/en/

45 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 smallholder 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)

46 In IFs, food demand is conceptualised as an effective demand, which is made of two components: access to calories and ability to buy or consume those calories.

47 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 effects 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.

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

49 Angola increased yields from 4 to 5.7 metric tons per hectare from 2005 to 2010.

50 Mozambique saw a similar increase (4.2 to 5.3 million hectares) between 2000 and 2005.

51 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.

52 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. (B Hughes, D Joshi, J Moyer, T Sisk and J Solórzano, Patterns of Potential Human Progress, *Strengthening Governance Globally*, Paradigm, Oxford University Press, Boulder, 5, 2014, 6.)

53 The Ifs defines government capacity as the ability to both raise funds (revenue) and allocate those funds to productive endeavours.

54 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 (World Bank, Worldwide Governance Indicators, 2017, http://info.worldbank.org/governance/WGI/#doc.

55 Revenue includes domestic revenue collection and aid contributions.

56 Corruption as measured by Transparency International's Corruption Perception Index.

57 Out of 176.

58 Boats and a scandal: Mozambique's default, *The Economist*, 19 January 2017, www.economist.com/news/middle-east-and-africa/21715030-mozambique-fails-pay-its-debts-mozambiques-default

59 I Gqada, A Boom for Whom? Mozambique's Natural Gas and the New Development Opportunity, *South African Institute of International Affairs*, August 2013.

60 Boats and a scandal: Mozambique's default, *The Economist*, 19 January 2017, www.economist.com/news/middle-east-and-africa/21715030-mozambique-fails-pay-its-debts-mozambiques-default

61 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.

62 The Current Path assumes that debt levels (in absolute terms) remain relatively flat over the next 10 to 15 years.

63 Namibia achieved an even higher increase between 2012 and 2015.

64 Angola and Zambia achieved similar increases between 2006 and 2011 and 2009 and 2014 respectively.

65 Zambia increased economic freedom index between 1990 and 1995 from 3.1 to 4.8.

66 Namibia and Botswana have achieved higher improvements within a five-year period.

67 Five-year moving average.

About ISS Southern Africa Reports

Southern Africa Reports provide the results of in-depth research on the latest human security challenges in the region. Some reports analyse broad conflict trends and threats to peace and security in specific Southern African countries. Others focus on challenges in the region such as electoral reform, corruption or intra-state conflict. The countries covered by the Southern Africa Reports are: Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe.

About the authors

Alex Porter, Research Consultant, African Futures and Innovation, Institute for Security Studies
David Bohl, Research Associate II, Frederick S. Pardee Center for International Studies
Stellah Kwasi, Research Assistant, Frederick S. Pardee Center for International Studies
Zachary Donnenfeld, Researcher, African Futures and Innovation, Institute for Security Studies
Jakkie Cilliers, Head, African Futures and Innovation, Institute for Security Studies

About the ISS

The Institute for Security Studies (ISS) partners to build knowledge and skills that secure Africa's future. Our goal is to enhance human security as a means to achieve sustainable peace and prosperity. The ISS is an African non-profit organisation with offices in South Africa, Kenya, Ethiopia and Senegal.

Using our networks and influence, we provide research, practical training and technical assistance to governments and civil society. This promotes better policy and practice, because senior officials can make informed decisions about how to deal with Africa's human security challenges. For more, visit www.issafrica.org.

Acknowledgements

This report was made possible by the support of Irish Aid and the Hanns Seidel Foundation. The contents of this report are the sole responsibility of the ISS and Frederick S. Pardee Center and do not necessarily reflect the views of Irish Aid. The authors would like to thank Irish Aid for commissioning the original research for this project. The ISS is also grateful for support from the members of the ISS Partnership Forum: the Hanns Seidel Foundation and the governments of Australia, Canada, Denmark, Finland, Ireland, Japan, Netherlands, Norway, Sweden and the USA.

Cover image: Bilfinger

ISSN 1026-0404