

# South Africa first!

## Getting to Thuma Mina

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South Africa is growing more slowly than its peers. What can be done to turn its prospects around? This report diagnoses South Africa's weak growth outlook to 2044. It then presents an alternative, aspirational vision for South Africa called Thuma Mina that is focused on spurring long-term growth by transforming health and education; resolving the electricity crisis in a way that enables modern industrialisation; and implementing land reform that unlocks greater agricultural potential.

## Key findings

- ▶ South Africa's weak growth pattern has put it on an economic divergence pathway from both high-income countries and its middle-income country peers to 2044.
- ▶ The country's demographic profile is favourable for a period of high growth, but requires appropriate health and education interventions.
- ▶ Currently, the lack of technological sophistication caused by poor human development is the most significant drag on long-term economic growth, followed by a lack of investment capital.
- ▶ In the Thuma Mina scenario, South Africa regains its economic footing and gets on a convergence path with its peers.
- ▶ Reforms in the electricity sector are key to unlocking growth in the short to medium term.
- ▶ Thuma Mina shows that access to more productive capital that revives manufacturing and increases trade is a clear economic game changer for South Africa.
- ▶ Human capital improvements are about as effective as reforms in energy in supporting growth in the long run, and are central to ensuring growth is inclusive.
- ▶ Unfortunately, poverty and inequality will remain for the foreseeable future, even in the best-case scenario.
- ▶ Thuma Mina is far from utopian, and there is no easy road or quick fix for South Africa; however, it shows that structural interventions can raise the growth baseline and make the country more resilient to future shocks.

## Recommendations

The South African government should consider the following points to achieve the productivity and growth to which it aspires:

- ▶ Many if not all of the critical reforms needed to put South Africa on a more positive growth pathway are under active discussion, even as urgent action and implementation remains wanting.
- ▶ Evidence must drive decision-making, rooted in an honest accounting of the present reality and the implications of that reality for the future.
- ▶ In the short run, the electricity crisis must be solved, and greater policy certainty and a friendlier business environment must be created, including making the state less reliant on dysfunctional state-owned enterprises.
- ▶ In addition, fiscal consolidation for the next several years requires reductions in the provincial and local government salary bills, as well as in the procurement of goods and services, to enable productive government spending and redistribution.
- ▶ Recent growth in investment flowing into South Africa should continue to be supported through governance reforms to improve the ease of doing business and ensure policy stability, including addressing the issue of public safety.
- ▶ To achieve inclusive growth in the long term, it is also essential to address human capital-based productivity challenges, namely quality improvements in the areas of health and education.
- ▶ Changing South Africa's Current Path prospects will ultimately require deliberate choices, determined implementation, leadership and some pain.

## Introduction

In 2019 South Africa entered its 25<sup>th</sup> year of democracy, and South Africans celebrated the freedom, prosperity and hope that 1994's historic transition gave to millions. However, reflections on the past have been overshadowed by the challenges of the present, and what they could mean for the country's future. Load-shedding, corruption and patronage now dominate public discussions.

The key challenges that loom large are inequality; extraordinarily high levels of unemployment linked to pervasive deindustrialisation and entrenched rural poverty; the crisis in state-owned enterprises, Eskom in particular; lack of access to quality education and healthcare for all; and water scarcity.

These issues affect all South Africans, and the degree to which the country can resolve them will shape its future. This report analyses South Africa's current development trajectory and offers a realistic vision of achievable progress by looking ahead 25 years to 2044. This vision is set out in a combined scenario called 'Thuma Mina', or 'send me'.<sup>1</sup>

Thuma Mina shows that, taken together and thoughtfully sequenced, a collection of aspirational but realistic interventions can positively shape the future of South Africa. It will, however, take longer than most think and any number of practical and political obstacles will have to be overcome in the process.

We begin with a brief discussion of South Africa's economic outlook on the Current Path, i.e. where South Africa is currently headed. The report then diagnoses the main structural constraints on economic growth in terms of the standard contributions of labour, capital and technological sophistication.

We find that poor human capital is the largest structural constraint on growth, even as a focus on investment and modern industrialisation is needed to unlock more rapid growth in the short and medium term.

Finally, it emulates the impact of the successful implementation of reforms in five intervention clusters that contribute to the combined Thuma Mina scenario.

The intervention clusters include successful transformation of the **health** and **education** systems; a

resolution to the crisis in **electricity generation** that enables a transition toward **modern industrialisation**; and the implementation of land reform that unlocks additional **agricultural potential** even against the headwind of water constraints and the impact of climate change. The modelled interventions are detailed in Annex 1.

This is not an idealised vision of where we wish South Africa would be, nor an accounting of the ways in which bad policy, cadre deployment and corruption have brought South Africa to its dismal present situation. Rather, our analysis looks at the structural constraints that have to be overcome.

A focus on investment and modern industrialisation is needed to unlock growth

The various scenarios are based on careful calibration of what is realistically possible based on comparisons of what has been possible elsewhere through a process of benchmarking.<sup>2</sup> Even then, success will require sacrificing any number of holy cows, as well as hard work and determined, joined up implementation by government, labour, business and civil society.

## Methodology and country groups

This report uses the International Futures forecasting system (IFs) developed and maintained by the Frederick S Pardee Center for International Futures at the University of Denver, United States (US) for much of its analysis and forecasts. The project draws on previous work on the long-term future of South Africa<sup>3</sup> using IFs. We use the latest public version of IFs (version 7.45) with an extensive additional project data file that updates key data series in IFs on education, government finance, health, infrastructure and population, drawing on the most recently available national and international data. See Annex 2.

Two country groups are used in this report as benchmarks for gauging South Africa's historical and future progress. Both draw on the World Bank's 2019 income grouping classifications. South Africa's World Bank income classification has been upper-middle

### Box 1: The International Futures (IFs) Model and the Current Path scenario

IFs is an integrated assessment model that projects around 500 variables across human, social and natural systems for 186 countries to the year 2100. It blends different modelling techniques to form a series of algorithms that express relationships across key systems, including demographics, health, agriculture, education, economics, infrastructure, energy and governance, among others. IFs uses historical data from 1960 (where available) to identify trends and produce a 'Current Path' scenario from 2015 (the current base year). The Current Path is a dynamic scenario that represents a continuation of current policy choices and technological advancements and that assumes no major shocks or catastrophes. However, it moves beyond a linear extrapolation of past and current trends by leveraging our available knowledge about how systems interact to produce a dynamic forecast. See <https://pardee.du.edu/understand-interconnected-world>

income since well before the transition to democracy in 1994, so the report compares South Africa to the global upper-middle-income group, excluding China since the size of the latter in both population and economic terms tends to skew group averages.<sup>4</sup> We typically use the acronym OUMICs (other upper-middle-income countries) to refer to this comparative country grouping.

In addition, a new country peer group was created that includes a more 'aspirational' collection of fast-growing peer countries than the OUMICs grouping. The criteria for this grouping are mainly economic. In addition, all countries are either electoral or substantive democracies.<sup>5</sup> We refer to this group as High-Growth Middle-Income Countries (High-Growth MICs). The countries are listed in Table 1 and the criteria are detailed in Annex 3. It consists of countries that on average have had a somewhat lower level of income than South Africa historically but whose gross domestic product (GDP) per capita overtook it in 2015.

The High-Growth MICs have historically grown more quickly than the OUMIC group, and are expected to grow 1.7 percentage points faster on average than South Africa to 2044 in the Current Path forecast.

All US\$ values from IFs used in this report were converted to 2019 dollars<sup>6</sup> and select values are converted into 2019 rand using the average exchange rate of ZAR14.44 to one US\$.<sup>7</sup>

### South Africa's growth outlook to 2044

The mainstream analysis is that South Africa has been caught in a classic middle-income trap for several decades.<sup>8</sup> The country's historical growth trajectory tracks that of the OUMICs and is significantly below that of the High-Growth MICs<sup>9</sup> (Figure 1).

On the Current Path, growth in South Africa's GDP is expected to average around 2.15% from 2020–2044, compared to 2.5% in OUMICs and 3.8% in the High-Growth MICs. This is less than half the 5.4% growth target originally set out in the National Development Plan 2030.

In the short term, it is likely that the persistent electricity shortages will limit growth prospects until at least 2022, which is the minimum lead-time for new-build capacity.<sup>10</sup> The Current Path growth forecast reflects this, and the model is fed with exogenous growth rates up until 2022 using the most recent forecasts from the International

**Table 1: List of countries included in the comparison groups**

OUMICs	High-Growth MICs
Albania, Algeria, Argentina, Armenia, Azerbaijan, Belarus, Belize, Bosnia, Botswana, Brazil, Bulgaria, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Equatorial Guinea, Fiji, Gabon, Georgia, Grenada, Guatemala, Guyana, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kosovo, Lebanon, Libya, Macedonia, Malaysia, Maldives, Mauritius, Mexico, Montenegro, Namibia, Paraguay, Peru, Romania, Russia, Samoa, Serbia, Sri Lanka, St Lucia, St Vincent and the Grenadines, Suriname, Thailand, Tonga, Turkey, Turkmenistan, Venezuela	Albania, Bosnia, Botswana, Bulgaria, Colombia, Costa Rica, Georgia, Indonesia, Kosovo, Macedonia, Malaysia, Mauritius, Mongolia, Montenegro, Paraguay, Peru, Romania, Serbia, Sri Lanka

**Figure 1: South Africa's average GDP growth rate from 1980 and Current Path forecast to 2044 compared to OUMICs and High-Growth MICs (five-year moving average)**



Source: Historical data from IMF World Economic Outlook 2017, forecast in IFs v7.45; growth rate is set exogenously to 2022

Monetary Fund (IMF),<sup>11</sup> adjusted slightly downward to account for the impact of the electricity constraint.

According to the convergence hypothesis, countries at a lower level of development tend to grow more quickly than those at a higher level of development, as measured by average GDP per capita.<sup>12</sup> On the Current Path, South Africa's average GDP per capita growth rate (0.8%) is below the average for both OUMICs (1.2%) and the High-Growth MICs (2%). The global average is 1.8%.

Structurally, South Africa's position in the middle-income trap is generally viewed as the result of the skewed, two-legged structure of its economy, which has a small, skilled and highly productive (private) sector and a large, poorly skilled and unproductive (informal) sector, with a substantive public sector somewhere in between these two extremes. This structure is rooted in apartheid, but has been worsened by the global financial crisis of 2007/8 and the impact of poor governance and state capture.

### Economic divergence

The resulting weak growth pattern has set the country on a pathway of economic divergence, not only from

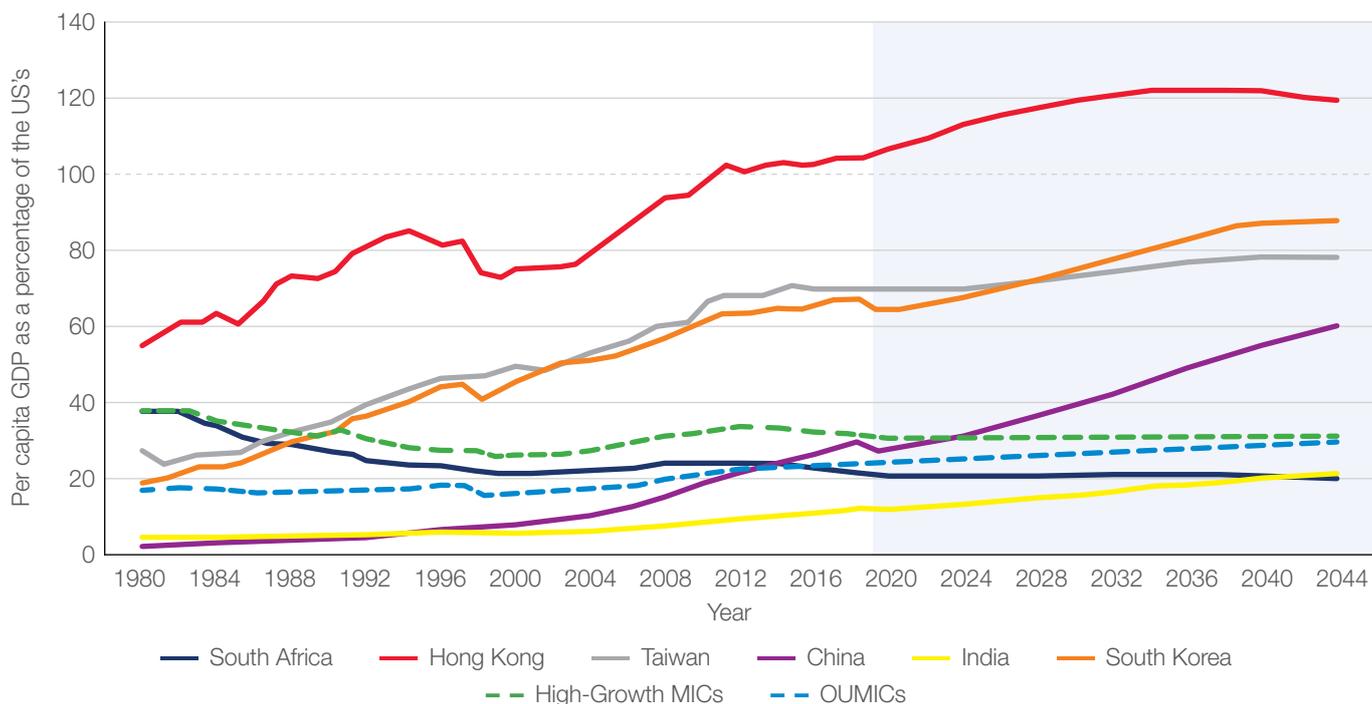
high-income countries but also from its middle-income peers (Figure 2). In 1980 South Africa's GDP per capita was nearly 40% that of the US, but in the Current Path scenario it is expected to drop to around 20% in 2044.

This is in stark contrast to countries like South Korea and Taiwan, which had a lower GDP per capita than South Africa until almost 1990 but now come within 25 percentage points of reaching the US by 2044. It is also below the average for the OUMICs and High-Growth MICs.

In addition, years of steady deindustrialisation, weak investment and government inaction in areas such as educational reform have undermined growth and growth potential. Value added from manufacturing is ebbing, and the sector is largely being replaced by low-end services (Figure 3).<sup>13</sup> According to one analysis, this has cost the country half a million jobs over the past two decades.<sup>14</sup>

Agriculture has likewise ceded value add to the services sector, going from over 6% of GDP in 1980 to less than 2.5% in 2016. The Current Path forecast for South Africa shows more of the same in terms of these recent trends.

**Figure 2: Economic convergence as measured by GDP per capita at PPP as a percentage of the US's GDP per capita in the same year (both measured in constant US dollars)**

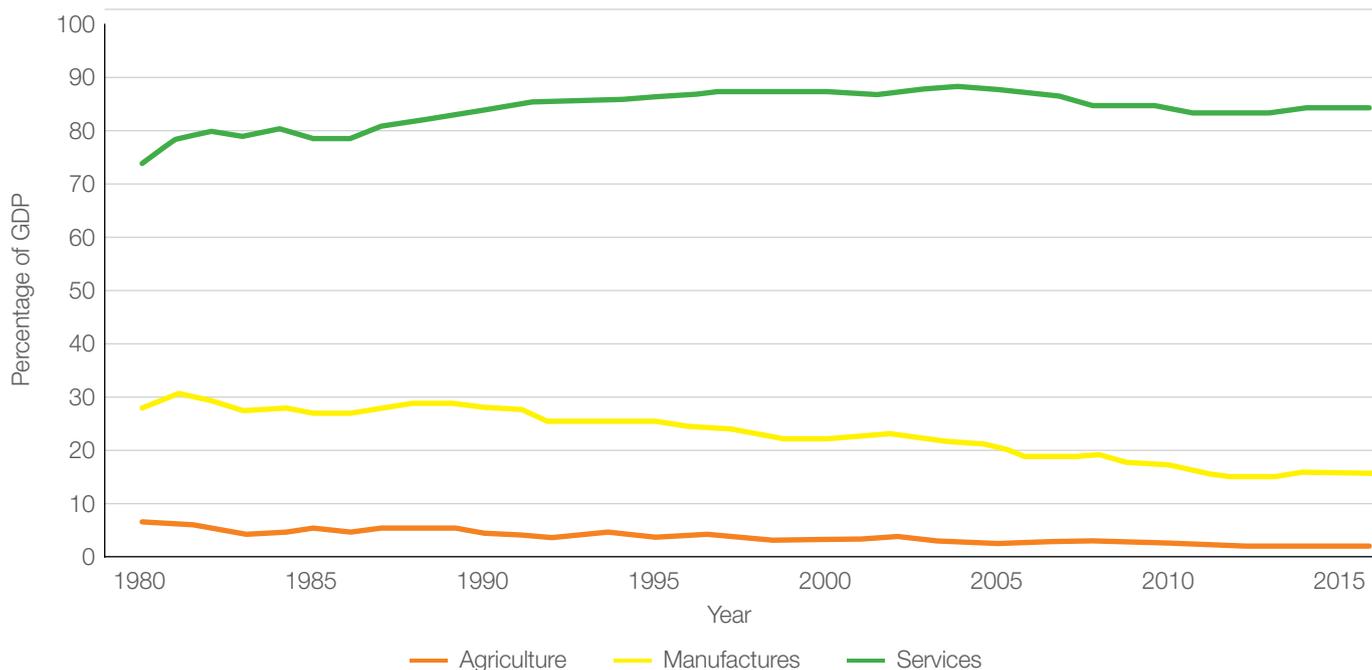


Source: Historical data from IMF World Economic Outlook 2017, forecast in IFs v7.45

Value added from information and communications technology (ICT) is expected to remain between 3 and 4% of GDP through 2044. This is far below that of

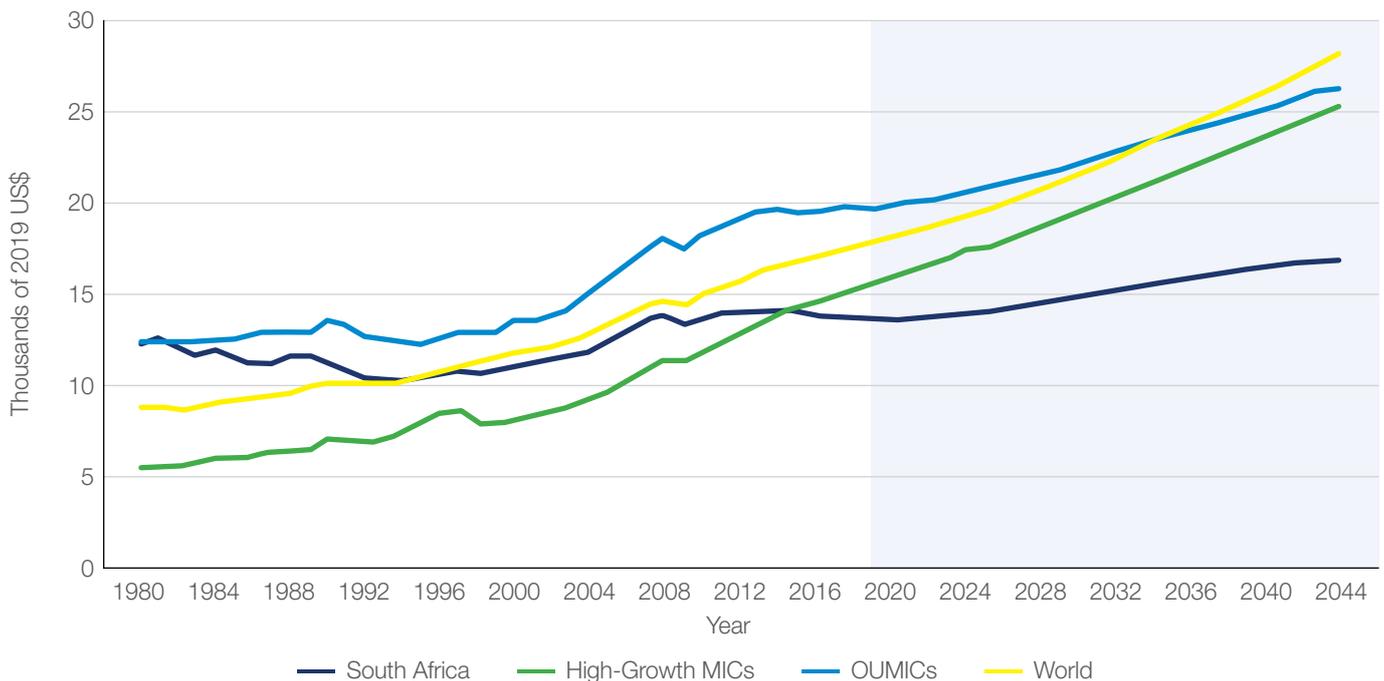
high-growth Asian countries such as Singapore (24%), Hong Kong (20%) and South Korea (10%), and is also well below the global average of 6.4%. The OUMICs

**Figure 3: Value added to GDP by sector as a percentage of GDP, history only (1980–2016)**



Source: World Bank national accounts data (from World Development Indicators) & OECD national accounts data files

**Figure 4: GDP per capita for South Africa, OUMICs, High-Growth MICs and the world**



Source: Historical data from IMF World Economic Outlook 2017, forecast in IFs v7.45; growth rate is set exogenously to 2022

and High-Growth MICs likewise have a greater value add from ICT, estimated at close to 5% and increasing to almost 7% in 2044.

The trends in manufacturing and ICT show there is little expectation of South Africa’s developing a robust modern industrial sector, and warn of continued divergence in wealth and wellbeing. Figure 4 presents the GDP per capita history and forecast.

Of course, average income (or GDP per capita) is not an end in itself. Rather, this report focuses on **inclusive growth**. This is because there is overwhelming evidence on the link between sustained high rates of economic growth and poverty reduction, formal employment creation and subsequent reductions in inequality. Indeed,

the central lesson from the past 50 years of development research and policy is that economic growth is the most effective way to pull people out of poverty and deliver on their wider objectives for a better life ... [though] the extent to which growth reduces poverty depends on the degree to which the poor participate in the growth process and share in its proceeds.<sup>15</sup>

Historical data also reveals an intimate link in South Africa between growth and unemployment (Figure 5). When the economy grows, so does employment. And without employment growth in the formal sector it is difficult to see how South Africa can making lasting progress in reducing inequality.<sup>16</sup>

Growth has been slowing since 2009 apart from a modest recovery period following the global financial crisis (2010 to 2013), and analysis from Stats SA using national poverty lines shows that income poverty increased between 2011 and 2015.<sup>17</sup> Using the World Bank extreme poverty line of US\$5.50 for upper-middle-income countries, the proportion of people living in poverty in South Africa is estimated at around 53% in 2020 – compared to 20% for OUMICs (i.e. more than double) and 41% in the High-Growth MICs (Figure 6).

Looking ahead to 2044, South Africa is expected to see a far smaller drop in extreme poverty than its peers, in line with its extraordinarily high levels of inequality and unemployment. Extreme poverty in the two comparison groups is forecast to decline to around 15% and 10% respectively by 2044, but is still expected to be 48% in South Africa.

**Figure 5: Real GDP growth and employment growth**

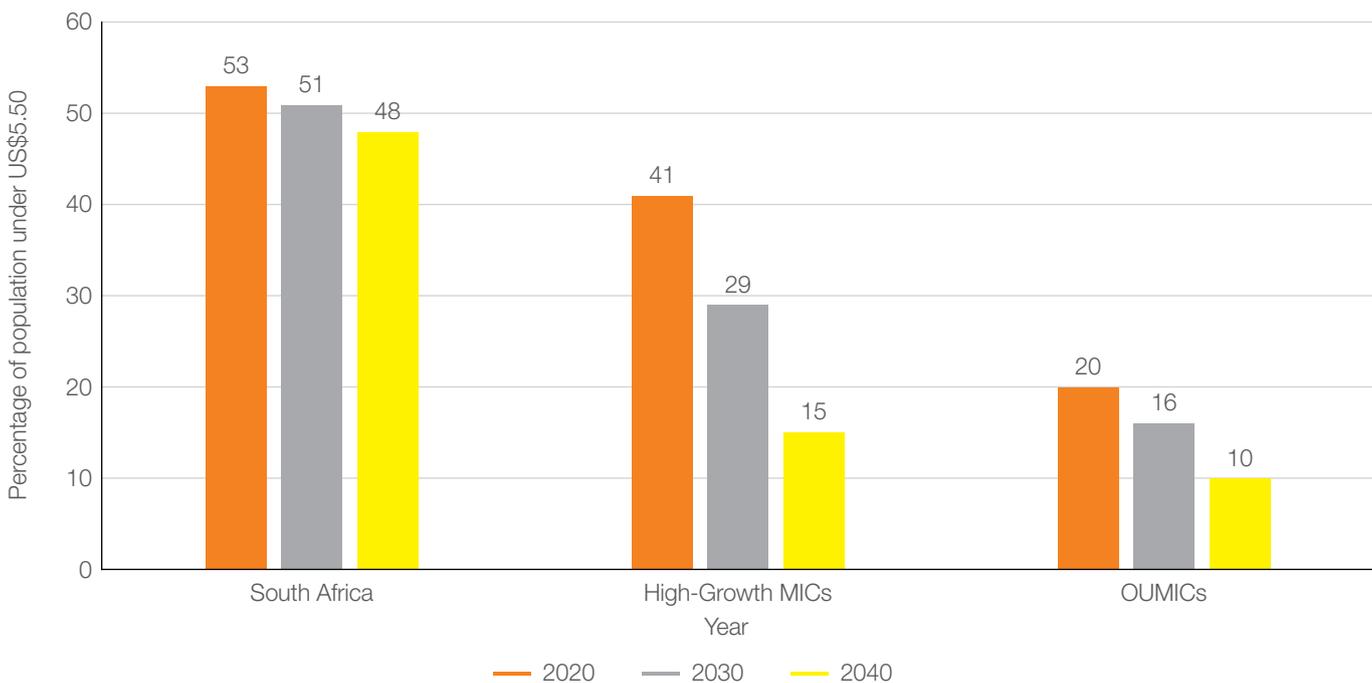


Source: GDP growth calculated with SARB data (Quarterly Bulletin), employment growth is the Labour Force Survey for 2000–2007, and the Quarterly Labour Force Survey for 2008 to 2018.

Inequality as measured by the gini coefficient is expected to remain stagnant in the Current Path. This means that South Africa will stay one of the

least equal societies in the world, along with Botswana, Suriname, Belize and Lesotho, until 2044. The country will therefore not meet the objectives of

**Figure 6: Forecasted levels of extreme poverty using the US\$5.50 extreme poverty line for upper-middle-income countries**



Source: IFs v7.45, initialised with data from the World Development Indicators (World Bank Group)

the United Nations' (UN) Sustainable Development Goals or South Africa's National Development Plan to eliminate poverty and reduce inequality by 2030.<sup>18</sup>

### Demographic potential

Population dynamics play an important role in economic development, and here South Africa has clear potential. Figure 7 presents the history and a forecast of South Africa's population by age cohort from 1980–2044.

The country's current population of around 60 million people is expected to grow to approximately 67 million by 2030 and 75 million by 2044. These numbers are significantly higher than those projected in the National Development Plan 2030, which expected a population of 58.4 million people by 2030. In reality, South Africa's population passed that number in 2019.

Rather than fertility, the biggest reason for higher-than-expected population growth seems to be inward migration. The country's total fertility rate fell from 3.1 births per woman on average in 1995 to around 2.3 today. Population growth is thus slowing, but not to the degree many expected.

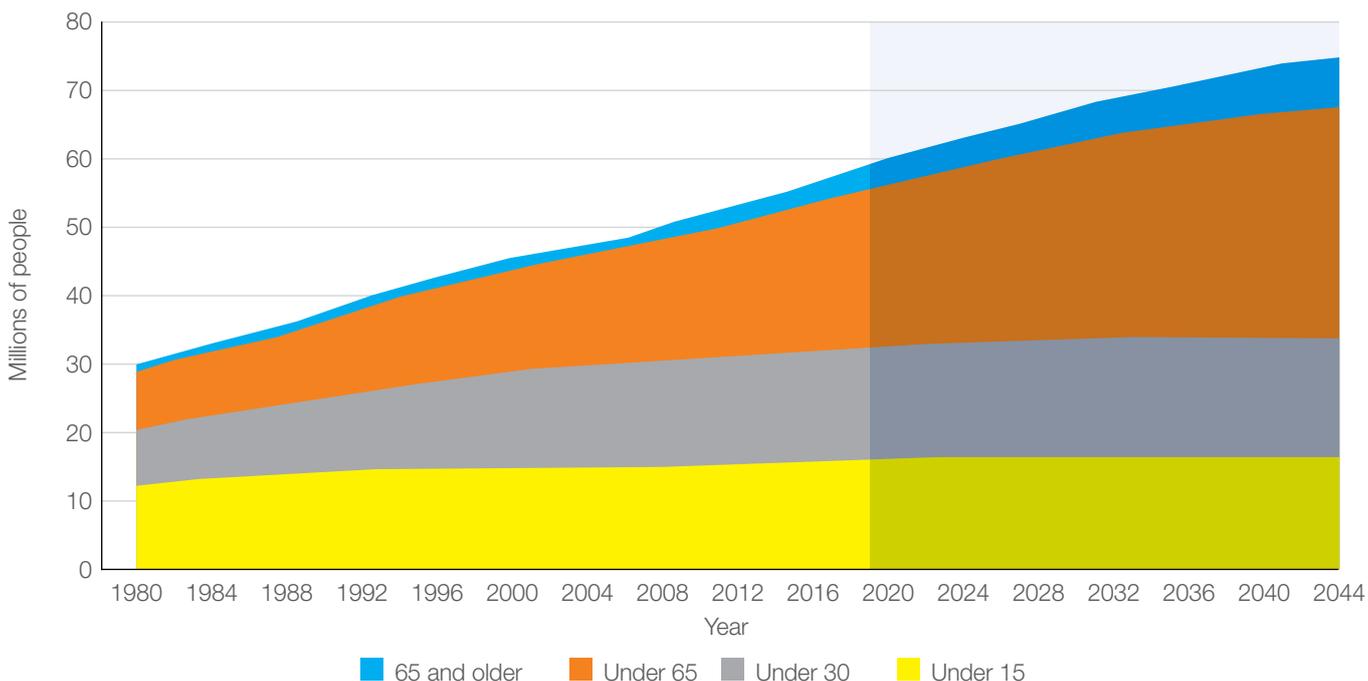
In addition, the population is ageing. Whereas only 6% of South Africans are currently 65 and older, by 2044 that portion will have increased to 10%. At the same time, the child population age cohort is expected to shrink in the years to come, both as a proportion of the total and in absolute terms.

Over time the ageing trend will affect service provision and fiscal stability. For example, the country's low savings rate will likely contribute to sustained levels of poverty and a greater demand for state benefits for the foreseeable future.<sup>19</sup> At the same time, a smaller child population could provide a much-needed opportunity for quality improvements in child-related services.

Furthermore, following recent trends, the country's population is expected to become increasingly urban in the Current Path.

Currently, about 66% of the population lives in urban areas, or around 39 million South Africans. The urban population has risen by 12 percentage points since 1994, when it was 54%. Over the forecast, urban population growth per year is around 1.4% compared to 0.9% in the total population, with around 15.7 million more people expected to be born in or relocate to an urban centre. In

**Figure 7: South Africa's population by age group**



Source: Historical data from Statistics South Africa (MYPE 2019), forecast in IFs v7.45

2044, three in four people in South Africa are expected to live in an urban area.

Like total population growth, internal migration plays a major role in urbanisation. Half of those moving between and within provinces and cities are relocating from other provinces in South Africa. Given its economic size, Gauteng is by far the largest recipient of migrants.<sup>20</sup> Historically, South Africa has also received a steady flow of international migrants, mostly from the region. There was a particularly large influx of foreigners after the start of the political process that culminated in the 1994 elections.

According to the September 2019 dataset on international migrant stock released by the UN Department of Economic and Social Affairs, South Africa is home to more than 4.2 million migrants from other countries (including refugees), who in 2019 constituted 7.2% of the country's total population. In contrast, the global average is 3.5% and that in sub-Saharan Africa 2.2%.

In the face of more than double the global average of migrants, poor border control, bad law enforcement, high levels of inequality and unemployment, anti-immigrant sentiment has started to bubble over and become increasingly violent.<sup>21</sup>

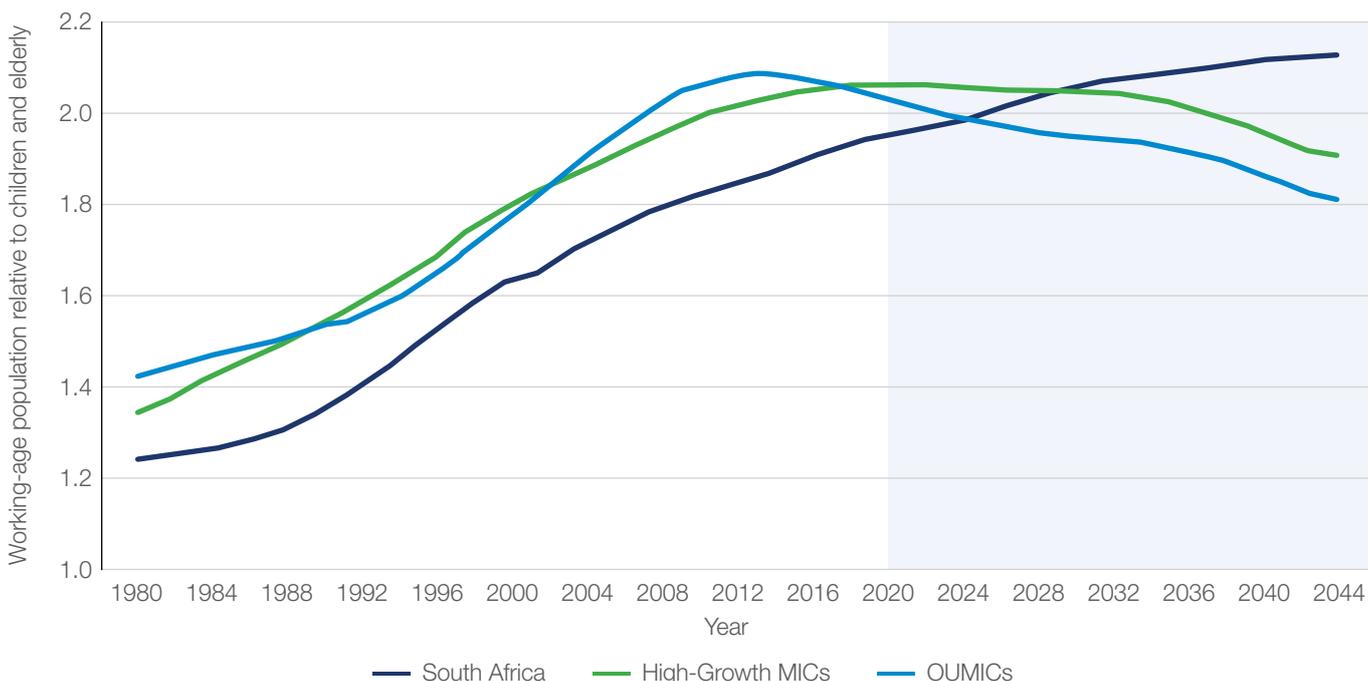
Finally, in 2019 South Africa had an estimated stock of almost 1 million migrants in Australia, New Zealand and the United Kingdom (UK), consisting mainly of skilled South Africans who have migrated due to political uncertainty, violence and low growth.<sup>22</sup>

Key to South Africa's growth potential is its position in a window of demographic opportunity. From a development perspective, a 'window of opportunity' opens when the ratio of working-age people (aged 15–64) to dependents exceeds a ratio of one dependent for every 1.7 persons of working age.<sup>23</sup>

This can cause a country to experience a sustained period of faster growth, generally termed a demographic dividend, as that labour makes an expanding contribution to economic growth. Evidence of the demographic dividend has been most compelling in East Asia, where it is credited with contributing as much as a third of growth at low levels of development.<sup>24</sup> South Africa entered this potential sweet spot in 2004.

As from 2024 South Africa's working-age-to-dependent ratio is forecast to be higher than the average for OUMICs, and as from 2028 higher than the High-Growth MICs (Figure 8). South Africa's working-age population is

**Figure 8: Demographic dividend: South Africa compared to OUMICs and High-Growth MICs (five-year moving average)**



Source: Historical data from UNPD medium-term population forecasts and Statistics South Africa (MYPE 2019) for South Africa, forecast in IFs v7.45

set to grow as a proportion of its total population over the course of the forecast, from its current level of 66% to 68% by 2044. The ratio of working-age people to dependents is expected to peak in around 2045 at 2.1 to one, after which it will slowly decline.

According to the demographic dividend hypothesis, South Africa should see more rapid income growth than the two comparison groups from 2028. The degree to which South Africa is able to feed, educate and create employment opportunities for the larger working-age population (as well as ensure that its workforce is healthy) is key.

In summary, South Africa has so far been missing an important demographic opportunity, but still has a chance to benefit from it in the foreseeable future.

Migration introduces uncertainty in the forecast, as in recent years it has had increasingly unsettling social consequences in the absence of sufficient economic and employment growth in an environment characterised by failing local government and poor policing.

Rather than accelerated growth, South Africa's demographic profile could instead bring about more youth unrest, fuel anti-immigrant resentments and

accelerate economic decline, if it should fail to manage and regulate inward migration from elsewhere in Africa; to reverse the loss of skilled outward migration; to institute policies that incentivise business investment by foreigners; and to invest in the educational and health investments outlined elsewhere in this report.

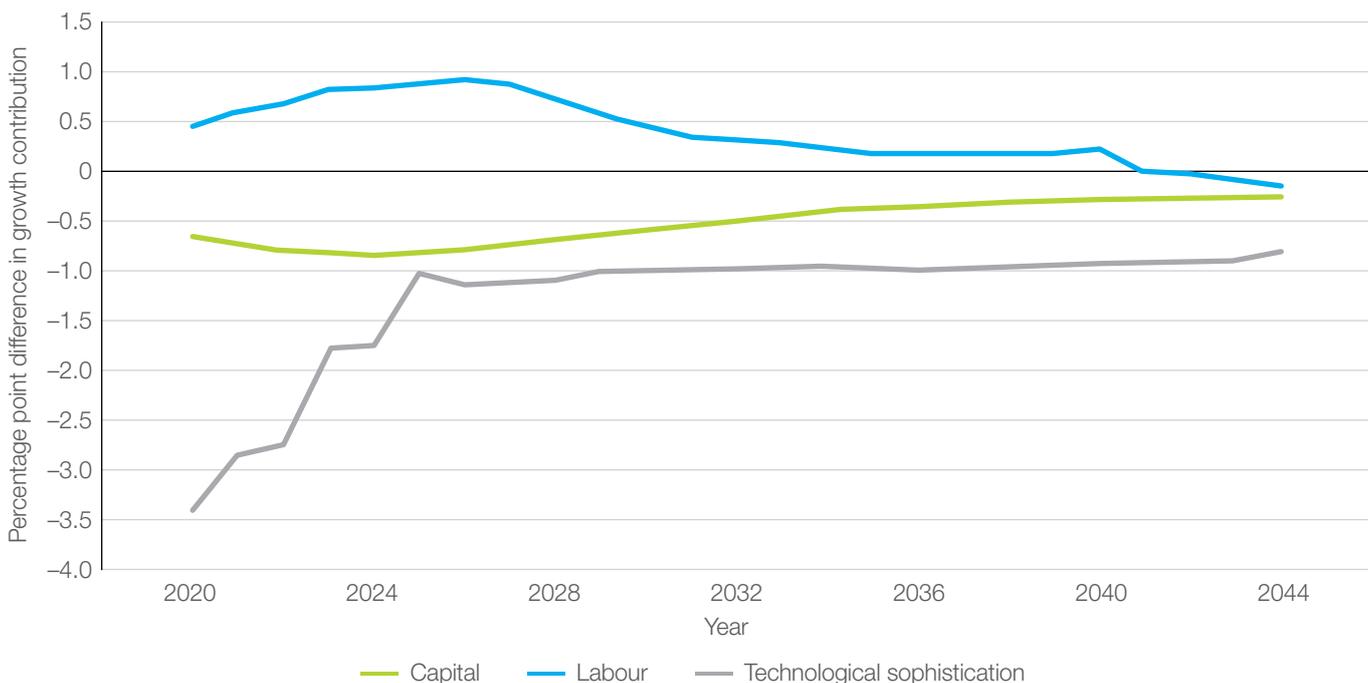
### Diagnosing South Africa's low growth prospects

So why, with a demographic dividend and its immense human and natural assets, is South Africa failing to translate that potential into prosperity?

To examine the reasons, we turn to standard analysis of the three contributors to economic growth, namely labour, capital and technology.

In the Current Path scenario, the difference in the contribution of each when comparing South Africa and the High-Growth MICs is set to evolve (see Figure 9). Clearly, technological sophistication is the most significant drag on economic growth, followed by lack of capital. The initial big drag that poor technology has in Figure 9 reflects the impact of electricity constraints on growth that, according to the Council on Scientific and Industrial Research (CSIR),

**Figure 9: Difference in contribution of capital, labour and technological sophistication to GDP growth – South Africa minus High-Growth MICs, 2020–2044**



Source: IFs estimate in v 7.45

## Box 2: Measuring productivity in IFs

The IFs system assesses the stock (e.g. labour force size) and flow (e.g. investment) dynamics between capital, labour and technology as a means to assess and model countries' long-term growth prospects. Technology is measured as multifactor productivity (MFP – termed technological sophistication in this report), and is further divided into four components – human capital, knowledge capital, social capital and physical capital. Additions to the initial MFP (or technological sophistication) are computed within the IFs system using inputs from other sub-models, such as from education. The growth forecast therefore represents the expected economic output from financial interaction between households, firms and government on the basis of both direct economic inputs such as labour and domestic or foreign investment, and deeper drivers such as the level of human development, quality of governance, and physical infrastructure that augment the quality and/or quantity of the direct inputs. In this way, IFs integrates longer-term issues, whereas most economic models focus on shorter-term equilibration and deal with the long run exogenously.

will only ease after 2022 in the best-case scenario.<sup>25</sup> From 2025 that drag levels off but remains larger than insufficient productive capital across the forecast horizon.

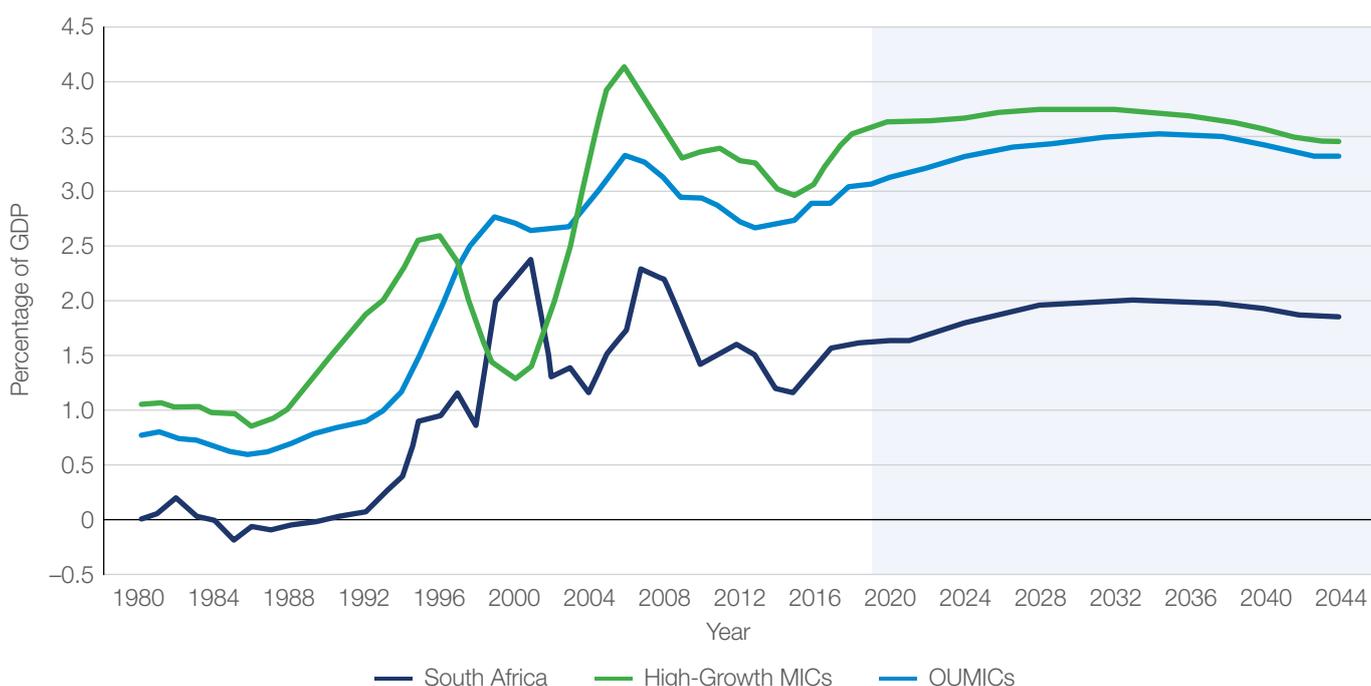
Labour, meanwhile, makes a positive but declining contribution to growth due to the country's positive population age composition (or demographic dividend) discussed previously.

Reflecting low business confidence, both foreign direct investment (FDI) and domestic investment are low in South Africa when compared to peers.

South Africa has an investment-to-GDP ratio of 18% that is forecast to remain around 20% of GDP, similar to the level seen in the most recent data in 2017. The investment target in the National Development Plan is 30% of GDP, implying, according to Duma Gcubule, a shortfall of around ZAR600 billion.<sup>26</sup> Domestic investment is more than 29% in the High-Growth MICs and 24% in the OUMICs across most of the forecast.

Turning to FDI, South Africa currently receives inflows of less than 2% of GDP. Although it did attract more FDI

**Figure 10: FDI as a percentage of GDP, five-year moving average for South Africa, OUMICs and High-Growth MICs**



Source: Historical data from World Development Indicators (World Bank Group), forecast in IFs v 7.45

after its transition to democracy, inflows slowed after 2000. Over the forecast, South Africa's FDI is expected to hover between 1.5 and 2% of GDP, compared to around 2.5% in the OUMICs and High-Growth MICs.

Encouragingly, there are signs that government action could turn these investment forecasts around from the trend of steady decline under Jacob Zuma. The Ramaphosa government has been actively pursuing domestic and international investment, and hosted two investment summits – in Johannesburg in October 2018 and November 2019 – against a target to raise US\$100 billion (or ZAR1.2 trillion) in new investment over five years.

Already, according to UNCTAD, South Africa received US\$5.3 billion of FDI inflows against outflows of US\$4.5 billion in 2018. This is a much better picture than 2017, when US\$2 billion came in and US\$7.3 billion left South Africa at the height of the Zuma presidency. In 2018, under Ramaphosa, FDI to South Africa had therefore more than doubled and remained stable in 2019.<sup>27</sup>

Moreover, South Africa's score on the World Economic Forum's (WEF) Global Competitiveness Index climbed seven places to 60<sup>th</sup> (out of 141 countries) from 2018 to 2019, reflecting a return of momentum following the shift in the political landscape.<sup>28</sup>

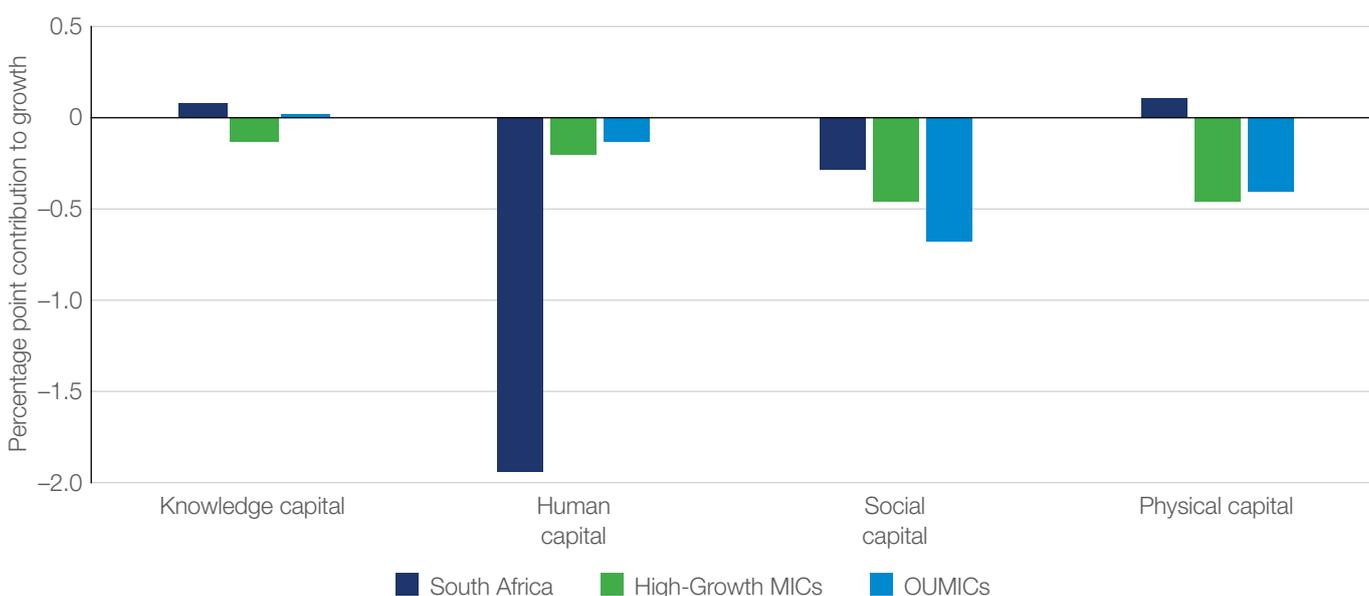
The WEF report points to the strong links between governance and investment in South Africa, and the delicate balance states must find between intervening to promote growth and overburdening the private sector. It notes 'remarkable' improvements from 2018 in restoring balance of powers, enhanced public sector administrative effectiveness and corporate governance.

Without consistently unlocking significantly larger levels of domestic and foreign investment for several decades, South Africa will not escape its slow growth trajectory.

Next to lack of investment, technological sophistication is clearly the biggest drag on growth and is set to remain thus across the forecast horizon to 2044. To better understand why, we dig deeper into the IFs system, which distinguishes between four sub-components of technological sophistication, namely health and education (human capital); governance quality and economic freedom (social capital); infrastructure (physical capital); and knowledge growth and diffusion (knowledge capital). Each cluster draws upon inputs from other sub-systems in the modelling platform and on government spending as it affects that cluster.<sup>29</sup>

Figure 11 compares the average contribution of the four sub-components of technological sophistication in South

**Figure 11: Technological sophistication and growth in South Africa compared to High-Growth MICs and OUMICs, average growth contribution by sub-component from 2023–2044 (negative values indicate a drag on growth)**



Source: IFs estimate in v7.45

Note: The averages are from 2023, the year when electricity ceases to constrain growth, to 2044

Africa – knowledge, human, social and physical capital – to the average of the High-Growth MICs and OUMICs in the IFs forecast to 2044.

Human capital stands out as South Africa's greatest challenge by far. The country has a small comparative advantage in knowledge capital, which is a net contributor to growth, and in physical capital. The positive contribution from knowledge capital is underpinned by South Africa's high levels of integration into the global economy and the positive impact of knowledge diffusion through trade and multinational corporations active in the country. The positive impact of physical capital flows from South Africa's relatively high levels of infrastructure and basic service provision such as water and sanitation as compared to the peer groupings.

## Violence cost South Africa as much as 13% of GDP in 2016

In IFs, the social capital component of technological sophistication captures the quality of governance in terms of political and individual freedom, government effectiveness, corruption, economic freedom and democratisation. Although doing better than the High-Growth MICs and OUMICs, social capital is also a drag in South Africa compared to its level of development.<sup>30</sup>

South Africa scores better on gender empowerment than the average, and its score of 0.7 is on par with that of group leaders such as Costa Rica and Argentina. It is also less corrupt – as measured by Transparency International's Corruption Perception Index – than the averages for both the High-Growth MICs and OUMICs groups.<sup>31</sup>

The main reason for social capital's being a drag on growth is our poor score on crime and security, which has ripple effects across the economy. According to data from the Global Burden of Disease Study-2017,<sup>32</sup> South Africa ranked sixth globally for homicide death rates among adult men and second globally for women, with most deaths occurring among those aged 15–64. The homicide death rate among children under 15 in South Africa was reportedly the highest in the world in 2016.

Homicides are a proxy for broader violence patterns in a society, and the overall burden of violence in South Africa was estimated to cost the economy as much as 13% of GDP in 2016.<sup>33</sup> A separate 2018 study found that the yearly cost of violence against children alone came to nearly 5% of GDP,<sup>34</sup> and research in Asia has shown exposure to violence in childhood has similar effects as stunting.<sup>35</sup>

The WEF also points out that security acts as a major check upon investment in South Africa, as do issues with transparency and government adaptability, the lack of business dynamism because of the rigid labour market, and administrative burdens.<sup>36</sup>

Improving governance as part of a pro-growth agenda is not a straightforward task, but security issues and economic freedom would be good places to start to help South Africa recover from its recent experience with ongoing governance failure under the Zuma presidency – particularly the deterioration in the criminal justice sector and rampant state capture.

## Poor human capital as the largest constraint on growth

Poor human capital thus hampers technological sophistication, as do low levels of investment or lack of capital. In this section we look at the health and educational characteristics that largely drive the human capital constraint.

### Health

Life expectancy at birth is one of the best aggregate measures of health and wellbeing, and a powerful tool in explaining the huge drag that human capital in South Africa has on economic growth.

Figure 12 presents the basic storyline of the impact of HIV/AIDS. At the height of the scourge in 2006, life expectancy was a mere 51 years, compared to 71 and 73 years in the High-Growth MIC and OUMICs groups respectively.

South Africa's life expectancy has subsequently recovered to its previous trajectory, but is still more than 12 years below that of the other two groups, at just over 62 years. While on a positive trajectory, it remains relatively constant at this dismal rate below the peer groups across the forecast horizon, getting to just below

**Figure 12: Life expectancy in South Africa and country peer groups (five-year moving average)**

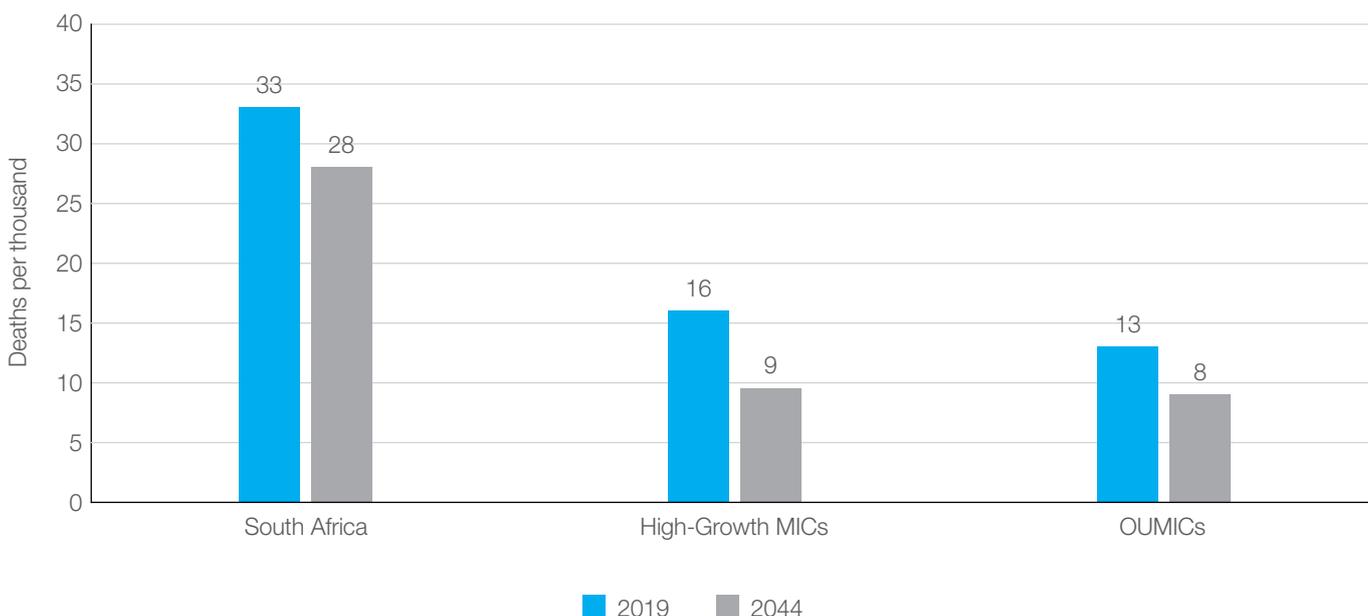


Source: Historical data from Institute for Health Metrics and Evaluation and Statistics South Africa (MYPE 2019), forecast in IFs v7.45

67 in 2044. This is in large part due to an unusually high burden of communicable diseases, in particular HIV/AIDS and tuberculosis. A second general indicator of health is infant mortality. Figure 13 compares rates of infant mortality in South Africa in 2019 and 2044 with that in

High-Growth MICs and OUMICs. Again, the differences are stark, with infant deaths per 1 000 in South Africa more than double that of the comparison groups. While the High-Growth MICs can expect a near halving of infant mortality rates by 2044, South Africa will

**Figure 13: Rates of infant mortality in South Africa and country peer groups**



Source: IFs v7.45, initialised with historical data from Statistics South Africa (MYPE 2019)

make much slower progress, dropping from 33 to 28 deaths per 1 000 over the forecast horizon. South Africa's mortality profile effectively belies its level of development. A much larger proportion of people are dying from communicable diseases than is typical for middle-income countries, at 3.7 deaths per 1 000 compared to 0.8 and 0.6 per 1 000 in the High-Growth MICs and OUMICs.

South Africa's communicable disease death rate is therefore almost five times that of the other two groups, although its mortality profile is expected to shift over the forecast period toward one that more closely resembles the average for OUMICs, as shown in Figure 14.

Figure 14 also presents, in a stark manner, the high rates of mortality among South African youth and working adults (from age 15 upward). Many more South Africans die at younger ages from injuries (e.g. from violence and traffic accidents) and communicable and non-communicable disease than the average for OUMICs. Looking at injuries, there is a particularly harsh toll evident on the working-age and child populations in South Africa, reflected in the larger portion of red bars.

South Africa's death rate from communicable diseases is almost five times that of its peer groups

Even by 2044, death rates from communicable diseases among children will continue to characterise South Africa's mortality profile, in contrast to a much lower relative burden in the OUMICs. However, non-communicable diseases, which are costlier to treat, are beginning to take over as the leading cause of death.

This trend, in addition to population growth, means that South Africa will have to spend more on healthcare. In essence, the country will have to spend less on HIV/AIDS as those numbers drop, but this will be countered by the burden of an ageing society more prone to more expensive non-communicable diseases.

While mortality is inevitable, premature mortality, morbidity and malnutrition speak more directly to the ways in which poor health and wellness limit people's wellbeing and ability to lead productive lives.

Stunting in childhood, for example, creates a major constraint on income for the rest of a person's life. In South Africa it is expected that a child born today who is stunted will only be 41% as productive as she would have been under optimal health and education conditions. With the level of childhood stunting at 30% nationally, this translates into an estimated loss of 7–10% of GDP per capita.<sup>37</sup>

Ending child stunting is – in addition to being a constitutional mandate – a productivity-enhancing intervention whose impacts are virtually certain. However, if achieved tomorrow, it would only be felt from the late 2030s.

South Africa's co-occurrence of communicable and non-communicable diseases is commonly referred to as the double burden of disease; however, in South Africa, some have said a quadruple burden is more apt, when injuries and infant and maternal mortality are also considered.<sup>38</sup>

Given these harsh realities for child safety, health and wellbeing, it is perhaps unsurprising that many children struggle to achieve basic literacy skills.

## Education

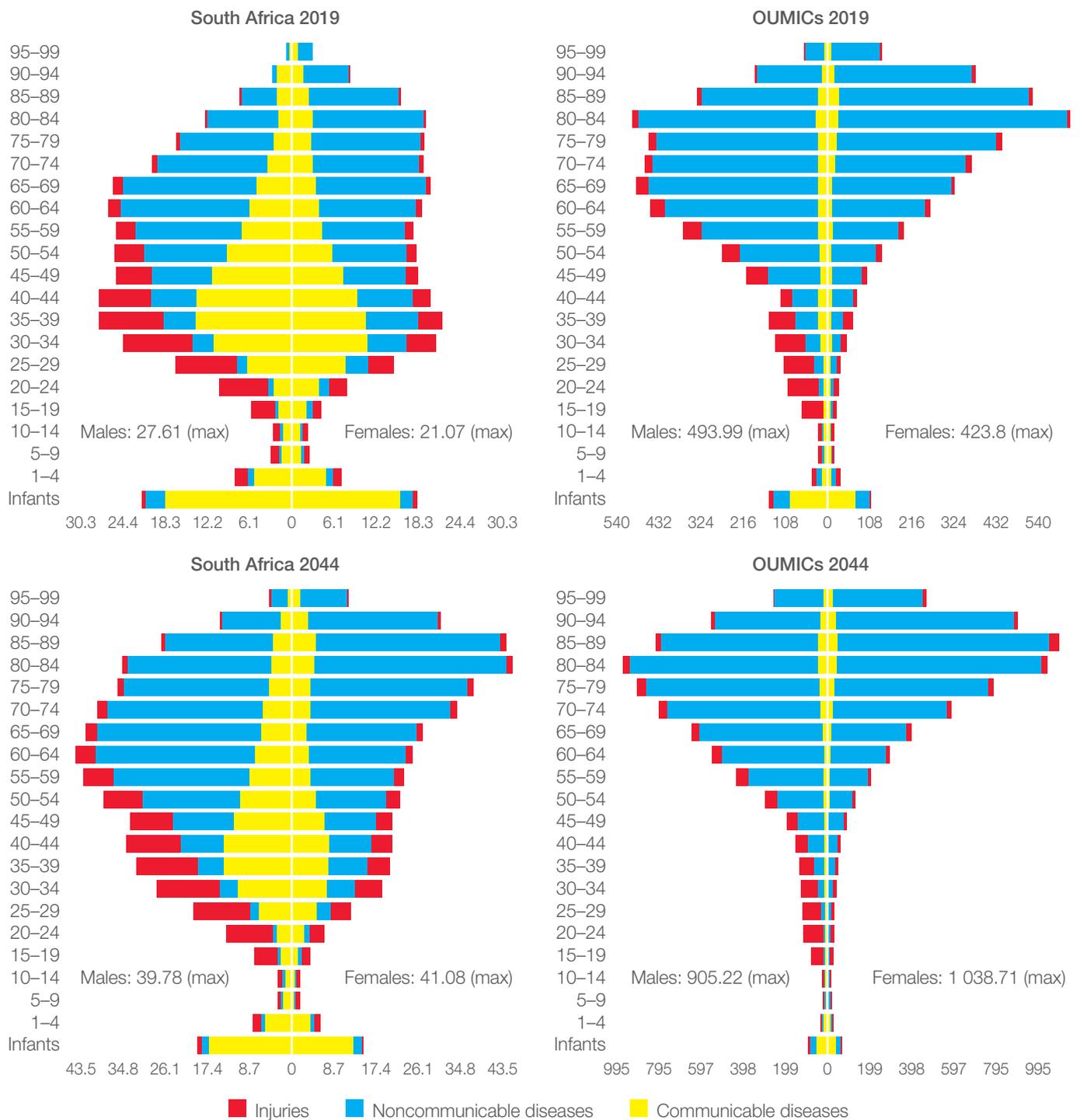
Recent work on inequality in South Africa's education system has found staggering disparities in educational outcomes, to the degree that

[t]he life chances of the average South African child are determined not by their ability or the result of hard work and determination, but instead by the colour of their skin, the province of their birth, and the wealth of their parents. These realities are so deterministic that before a child's seventh birthday, one can predict with some precision whether they will inherit a life of chronic poverty and sustained unemployment or a dignified life and meaningful work.<sup>39</sup>

This weak foundation for the underprivileged majority of South African learners begins to show itself in the country's primary school survival rate,<sup>40</sup> and becomes increasingly apparent later in learners' educational career.

South Africa's primary survival rate (87%) is around nine percentage points lower than the averages for OUMICs and High-Growth MICs. Lower secondary (through grade 10) and upper secondary (grades 11 to grade 12 or

**Figure 14: Mortality profile in number of deaths by age cohort in South Africa for 2019 and 2044, compared to OUMICs**



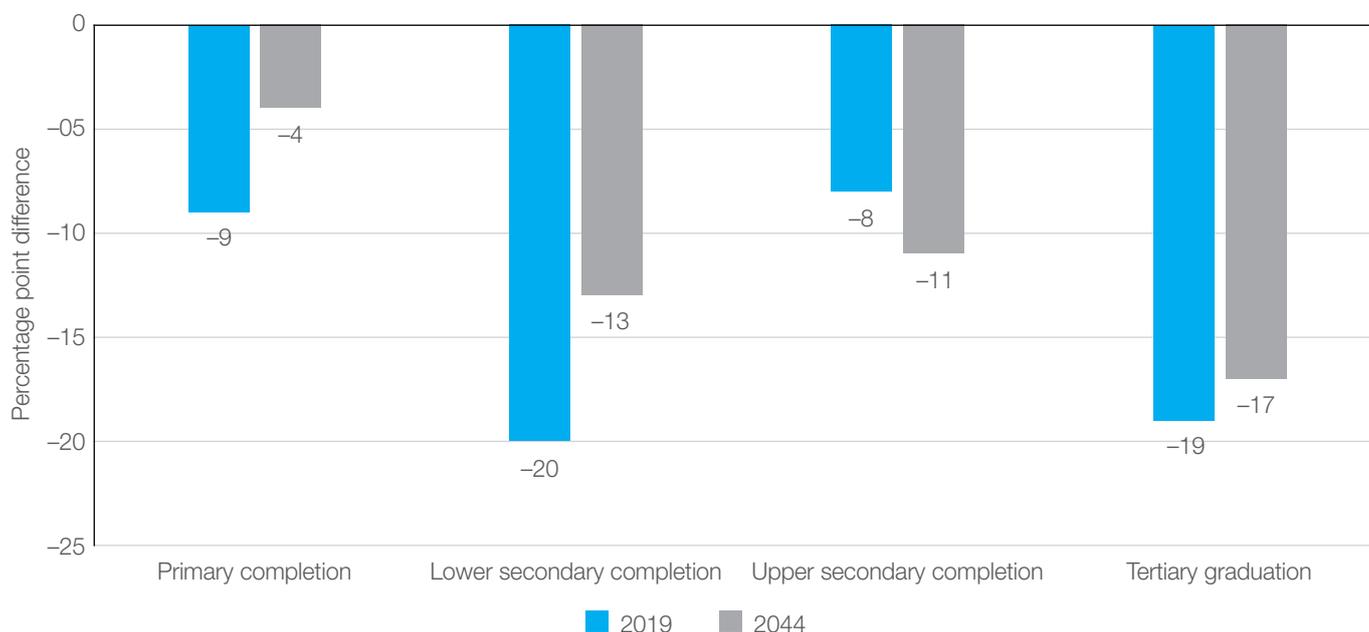
Source: IFs 7.45, initialised from Global Burden of Disease Study-2017 (Institute for Health Metrics and Evaluation) and Thembisa Model v 4.2 for HIV/AIDS for South Africa (Centre for Actuarial Research, University of Cape Town)

matic) completion rates are also markedly lower in South Africa than in its OUMIC peers, as learners eventually drop out of the system with fewer and fewer completing key subjects such as mathematics.<sup>41</sup>

Figure 15 shows the difference in outcomes between South Africa and OUMIC group averages.

The challenge starts in primary school (although South Africa will, by 2044, reduce the gap by about half). Lower

**Figure 15: Difference in rates of survival and completion/graduation between South Africa and OUMICs in 2019 and 2044 (South Africa minus OUMICs)**



Source: IFs 7.45 initialising from Barro-Lee and UNESCO.

Note: Survival rates are percentage of entering students. Completion rates for primary and secondary are percentage of age-appropriate children and for tertiary percentage of population 15 years and over. Graduation rates are percentage of age group.

secondary completion/graduation rates are significantly below the OUMIC averages (20 percentage points) and will moderately decline to a 13-percentage point difference by 2044, while the gap between South Africa and OUMIC averages for upper secondary graduation rates actually increases from 8 to 11 percentage points by 2044.

The situation at tertiary level is bad – 19 percentage points lower for graduation rates – and only slightly improves by 2044.

The situation becomes even more worrying when we turn our focus away from the *quantity* of education presented above to the *quality* of education, i.e. South Africa’s actual learning outcomes. Test scores and pass rates in the country suggest that poor retention is closely linked to the issue of low-quality education.

Test scores in South Africa are significantly lower than what would be expected (Figure 16). Instead of increasing, as required by a future preparing for the Fourth Industrial Revolution, the number of students taking subjects like mathematics is actually dropping.<sup>42</sup>

Whereas South Africa scores fairly poorly when comparing test scores on primary education, its scores

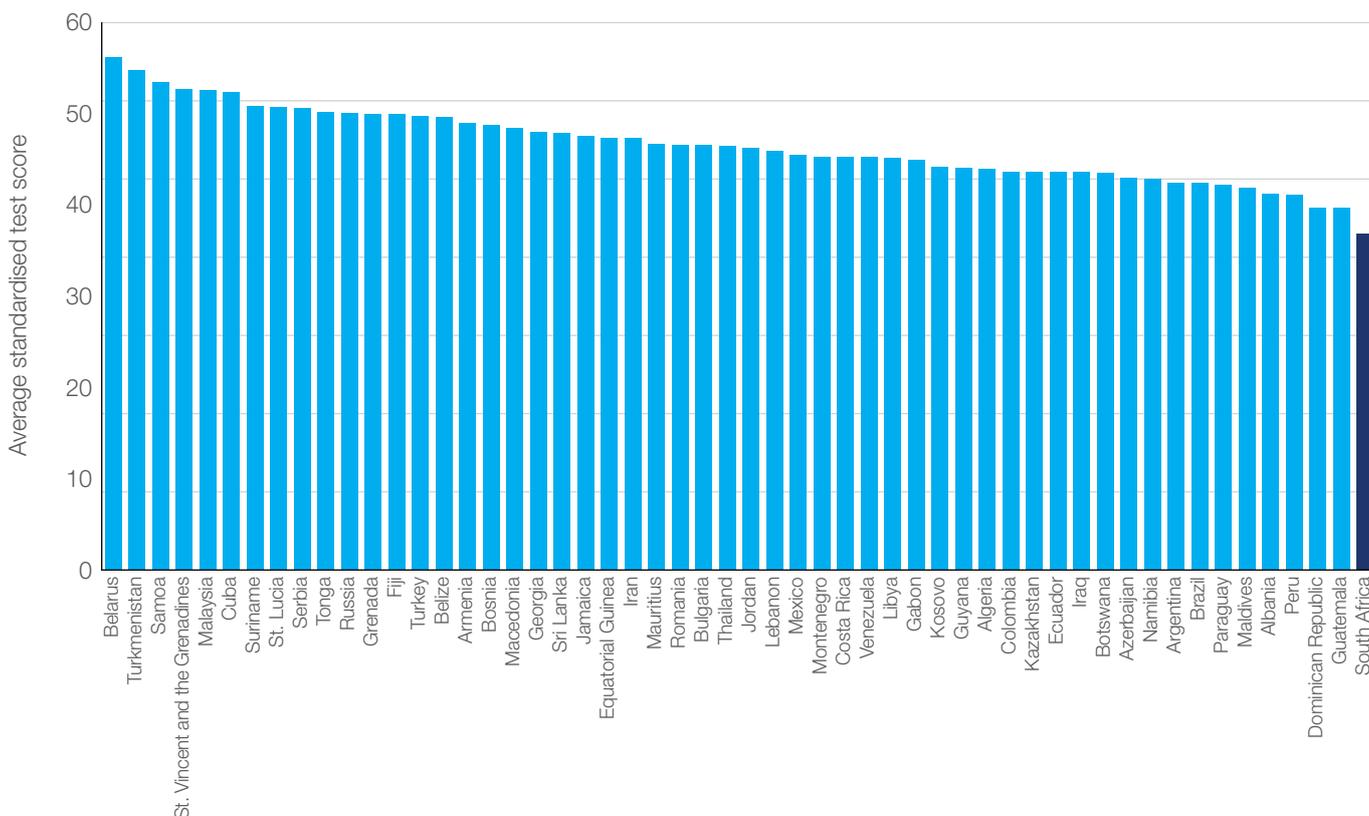
on secondary test scores are close to disastrous, being roughly 20 percentage points below those of peer groups. This is a stark contrast to the mean education years metric cited at the opening of the section.

These dismal outcomes are in spite of the fact that UN data on South African public spending on education as a per cent of GDP from 1987–2017 shows an average of 5.5%, with a minimum of 4.9% in 1989 and a maximum of 6.4% in 2012. At that point expenditure was about 1.7% of GDP – above the average for OUMICs. It has dropped since then, but remains on par with global standards.

However, since 1994 the South African education system has had to compensate for successive generations of very limited spending on education for a large segment of its population. This challenge has been compounded by the policy incoherence, bad management, corruption and aggressive unionisation that have become hallmarks of the country’s education landscape.

Furthermore, there is not enough focus on technical and vocational education, both at secondary and at tertiary levels – an issue that is now attracting more government attention.

Figure 16: Education quality in OUMIC countries and South Africa, estimates of secondary test scores for 2019



Source: IFs v7.45, initialised from Altinok et al., 2018 (test scores, historical)

South Africa has no vocational enrolment at lower secondary levels, and at the upper secondary level in 2016 its proportion of students in vocational training (12%) was only a third of the average for OUMICs (over 36%). However, it is higher than that for OUMICs in Africa, where vocational training has consistently been on the decline and currently accounts for less than 5% of upper secondary education.<sup>43</sup>

Finally, data on the National Senior Certificate (NSC) also speaks to the lack of preparation among learners to enter science, technology and mathematics (STEM) fields. Just under half of youths do not obtain the NSC. In the class of 2015, one-third of learners wrote the mathematics exam, and only 55% of those scored above the pass mark of 30%. In physics, one-quarter of learners wrote the exam, of whom 76% passed at the 30% mark.<sup>44</sup> The 2019 results indicate an improvement to pass rates of 53% for mathematics and 76% for physics, but fewer learners wrote the exams.<sup>45</sup>

Given how many students never reach matric, it is even more concerning that so few are prepared to study

STEM. The lack of preparation in secondary is expected to result in a shrinking proportion of students who are prepared to take on tertiary education, particularly in the STEM fields, which could lead to higher tertiary drop-out rates even as access to tertiary education expands.<sup>46</sup>

According to Agenda 2063, the African Union’s aspirational blueprint for Africa,<sup>47</sup> of those who enter tertiary education institutions 70% ideally should graduate in STEM subjects, but South Africa is clearly far from reaching that threshold.

### Getting to Thuma Mina: Change through five key sectors

Understandably, South Africans are fixated on the recent perfect storm of successive bouts of load-shedding, dramatic increases in electricity prices since 2007, the impact of the 2007/8 global financial crisis, Chinese competition in their backyard and the ruinous Zuma presidency that has left the governing party deeply divided. These factors have all accelerated South Africa’s deindustrialisation and set it firmly on a slow growth trajectory.

Government inaction (and slow action) has exacerbated the electricity crisis, which looms largest as an immediate constraint on South Africa's growth to 2022. In fact, without fixing electricity generation problems through institutional and legislative reform, improved management and maintenance, GDP growth will stay hobbled.

The Current Path analysis makes it abundantly clear that a 'business as usual' scenario is untenable. It will leave too many South Africans falling too far behind, and make the country more vulnerable to a range of plausible shocks and pressures, from the effects of climate change to the structural instability caused by a large number of unemployed youths amid intolerable levels of inequality.

South Africa needs to develop and *rapidly implement* policies that are based on evidence of what works in a modern economy, devoid of ideological considerations. Chief among these is the pursuit of rapid rates of economic growth that eventually translates into increases in formal employment, which alone can unlock sustained reductions in inequality.

Against this background, the Thuma Mina scenario seeks to address the sources of South Africa's economic stagnation and model their resolution through the five thematic areas identified in this analysis: health, education, energy, modern industrialisation and agricultural reform, including land reform and water management. These are briefly described below, and the calibration for the interventions is detailed in Annex 1.

We do not separately model the impact of additional investment, already in focus in the form of the various investment summits, but do include an increase in investment as part of the modern industrialisation intervention cluster.

## Health

The health intervention cluster focuses on reducing premature mortality, and includes two groups of interventions that operate on different timescales.

The first group covers social determinants of health, focusing on three immediate drivers: traffic deaths, interpersonal violence and malnutrition in the form of undernutrition among children and over-consumption among adults.<sup>48</sup> Some other long-term (or structural) drivers, such as low levels of income and maternal education, are addressed in other clusters. These

public health interventions do not rely on reform of the healthcare system beyond better management and increased efficiencies, so in the health scenario they gradually begin to take effect in 2021, and improvements increase to 2044.

The second group simulates the successful implementation of a national health scheme that eventually allows for universal healthcare for all. The effects begin to be felt in 2026 in the scenario, to reflect the National Health Insurance's (NHI) planned roll-out. There are three focus areas in this group: improved child and maternal health, reductions in communicable diseases and in non-communicable diseases.

South Africa needs to develop and implement policies that are based on evidence

Improvements are based on recent research in middle-income countries, including South Africa, that quantifies the efficacy of universal healthcare in averting premature mortality.<sup>49</sup> A growing number of studies show that quality plays a much larger role than previously understood in preventing premature mortality in low- and middle-income countries where, as with education, the focus has typically been on access.<sup>50</sup>

These priorities are in line with the stated intent of the government, which in 2018 convened the Presidential Health Summit to help address the failures that have hampered progress towards an integrated and unified health system.

In July 2019 President Cyril Ramaphosa signed the Presidential Health Compact in Tshwane to deal with what he termed 'the crisis facing our health system'. The goals include 'raising life expectancy, reducing the burden of disease and reducing infant mortality'. The goal of 'one country, one health system' that he spoke about is

a South Africa where our entire population has equitable access to quality healthcare for themselves, for their children, and for their parents and grandparents ... where our public health system is people-centred, is responsive to people's needs,

and where the views of communities are valued and respected ... where our clinics and hospitals are centres of excellence, where they are well-resourced and adequately staffed.<sup>51</sup>

The biggest obstacles to achieving improved health outcomes are over-servicing and inflated costs in the private healthcare system,<sup>52</sup> and a poorly functioning public healthcare system. Better management and more competition can improve both.

Meanwhile, the national fiscus is deteriorating and, based on its performance with state-owned enterprises (SOEs), the government seems unable to effectively manage anything of the magnitude of a national health scheme. Currently, the National Treasury is adjusting its initial assessment of the cost of the NHI programme, set at ZAR256 billion (US\$16.7 billion) a year by 2026 (including the current expenditure of ZAR220 billion).

The premise for improvements in the health system cuts across both the public and the private sector, reducing costs in the former and improving management in the latter to a point where greater synergies are eventually possible as part of a viable national health scheme.

## Education

The education cluster includes three intervention groupings aimed at transitioning South Africa's education system into one that can prepare the country to take full advantage of the Fourth Industrial Revolution.

First it takes on shortfalls in education throughput, starting with primary survival and going through to tertiary intake rates. Likewise, tertiary graduation is improved, and the proportion of STEM students increases to around a quarter. In addition, there is an increased focus on vocational training at the secondary level as an alternative to tertiary education. Finally, education quality is a core focus of this scenario, and aggressive but reasonable quality improvements are modelled at both the primary and secondary level as measured by test scores, gaining momentum over time.

## Quality improvements are core to both the health and education scenarios

These improvements would be in line with the vision expressed by Ramaphosa at the 2020 Basic Education Sector Lekgotla:<sup>53</sup>

We want to ensure that by 2030, South Africans have access to education and training of the highest quality, leading to significantly improved learning outcomes. The performance of South African learners in international standardised tests should be comparable to the performance of learners from countries at a similar level of development. All our learners should be able to read for meaning by their tenth birthday. Our Mathematics and Physical Science pass rates should



THE ABILITY TO READ IS CENTRAL  
TO THE ABILITY TO LEARN

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be comparable with, if not better than, nations of similar size and budget.

Achieving this vision will be challenging. A recent comprehensive report identified four binding constraints to improved educational outcomes for learners from low-income backgrounds:

- Weak institutional functionality impacting most negatively at the provincial level
- Undue union influence
- Teachers' lacking basic levels of content knowledge and pedagogical skills
- Wasted learning time and insufficient opportunity to learn<sup>54</sup>

The result is that around 60% of South African children 'do not learn to read for meaning in any language by the end of grade 3'.<sup>55</sup> The ability to read is 'central to the ability to learn', and without this basic achievement it is not possible for learners to make meaningful educational progress.<sup>56</sup>

Addressing these core challenges is central to reforming the education system from the ground up, but it will take time. Beyond various capacity issues, the largest obstacle to education reform is political, in the form of the power and influence that key public sector unions such as the South African Democratic Teachers Union have within the governing party and the educational sector.

The challenge that arises from the complex constitutional modalities that govern education in South Africa also bedevils the best efforts at holding government to account.

## Energy

There is little doubt that a renewables-based energy system is achievable from a technology standpoint and the best pathway for the country. The updated Integrated Resource Plan (IRP 2019) that was eventually approved by cabinet in October 2019 goes some way in acknowledging this potential.

The IRP 2019 – along with the subsequent appointment of new leadership in Eskom; practical discussions on a social compact between the government, labour and industry to stabilise its debt through a special purpose financial vehicle; and recent announcements to allow private entities to generate their own power – offers hope of a more

rapid energy transition away from coal towards gas and renewables, although both come off a very low base.<sup>57</sup>

In addition to the existing contracted commitment to extend electricity production from coal by 5.7GW, which should be online by 2022, the IRP 2019 envisions an additional 1GW of capacity from coal by 2030.<sup>58</sup> To this end the IRP 2019 notes that (emphasis added):

The extent of decommissioning of the existing coal fleet due to end of design life and commitment to reduced emissions post-2030, could provide space for a *completely different energy mix relative to the current mix*. In the period prior to 2030, the system requirements are largely for incremental capacity addition (modular) and flexible technology, to complement the existing installed capacity.<sup>59</sup>

To this end we amended our Current Path forecasts to broadly emulate the energy forecast contained in the IRP 2019 as a reasonable baseline.<sup>60</sup>

There is little doubt that a renewables-based energy system is achievable from a technology standpoint

Much more is possible. In the energy intervention cluster we benchmark our forecasts to the 70% renewable target by 2050 set out by the CSIR in the January 2020 release of a 'least cost' energy scenario.<sup>61</sup> To do so, we assume a release of the constraint on distributed electricity generation and the associated protection of the coal industry as the primary source of electricity generation. The result boosts investment in the energy sector and creates green jobs.

This will also require making the most of the Green Investment Fund, public-private partnerships and efforts such as the hydrogen initiative at the University of the Western Cape. The interventions are phased in over a period of 10–24 years from 2020.

To achieve these effects, the cluster reduces the capital cost per output unit of energy to reflect more rapid technological advancement that results from an enabling policy environment, as well as the impact of off-grid and mini-grids using renewables.

In addition, it increases labour participation rates to reflect, first, the impact of a less capital-intensive shift to renewables and the effective implementation of a 'just' transition programme that creates green jobs that replace and exceed those lost from coal production and second, the ripple effects in other sectors of the economy from a more reliable energy supply.

Finally, it includes a more prominent role for gas from sources such as the Brulpadda find and either a pipeline from the Rovumbu basin or the construction of a liquid natural gas terminal at one of the sites in KwaZulu-Natal or the Eastern and Western Cape currently under consideration. The new energy production profile is depicted in Figure 17. Coal inevitably still dominates in the energy scenario, but is overtaken by renewables a decade earlier than in the Current Path forecast.

Similar to reform of the educational and agricultural sectors, the political obstacles to the pursuit of a least-cost electricity pathway are significant. The most prominent of these are the efforts to protect Eskom's monopoly on power generation (loss of that monopoly further endangers its fraught business model) and the

leverage that the coal sector has in government policy in the form of the alliance between the governing party and organised labour. All of these are, however, weakening with every passing month.

While a least-cost energy pathway will unlock significantly more distributed jobs in the long run, it requires a bold, decisive approach and considerable political acumen.

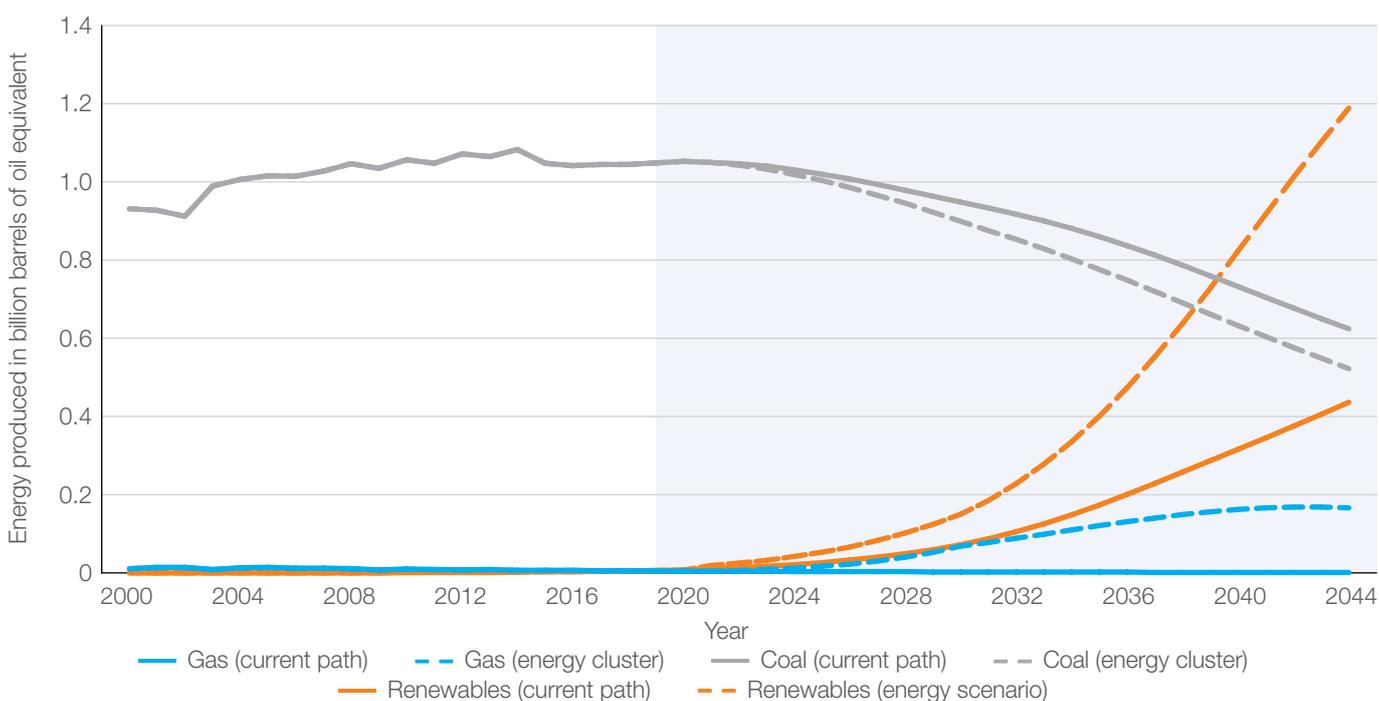
### Modern industrialisation

South Africa needs investment to re-ignite its manufacturing sector, which requires much greater policy certainty. During his June 2019 State of the Nation address, Ramaphosa spoke about the need to 'rebuild the foundations of our economy by revitalising and expanding the productive sectors' that 'requires us to reimagine our industrial strategy, to unleash private investment and energise the state to boost economic inclusion'.<sup>62</sup>

The transition to renewables presented in the energy cluster is foundational to modern industrialisation in South Africa.

The industrialisation intervention cluster includes four intervention groupings aimed at emulating an innovation-

**Figure 17: Energy production for the three main energy source types on the Current Path (solid lines) and in the energy intervention cluster (dotted lines)**



Source: Historical data from International Energy Administration, forecast in IFs v 7.45  
 Note: renewables category includes wind and solar

led, pro-growth pathway for South Africa. It starts with growing domestic investment, which is followed by increasing net FDI inflows as investor confidence rises.

Growth in investment for a modern industrial economy goes hand-in-hand with research and development, and in the scenario South Africa reaches its goal of allocating 1.5% of GDP to research and development by 2030. Increases in the volume and value of exports follow additional investment, with a focus on manufacturing and ICT, and trade interventions gain momentum to 2044 as the African Continental Free Trade Area is implemented.

The trade interventions follow separate work by the ISS that indicates South Africa stands to gain more than any other African country from the implementation of the free trade area.<sup>63</sup>

These improvements in economic output and the flow of capital in the economy are underpinned by a more conducive policy environment that is modelled using interventions to increase the ease of doing business and economic freedom. Finally, there is an acceleration in the expansion of ICT infrastructure, with an emphasis on fixed and mobile broadband Internet access.

## The transition to renewables is foundational to modern industrialisation in South Africa

The largest barriers to achieving the impacts modelled in this scenario are, first, uncertainty around finding a resolution to South Africa's electricity shortages and the crisis within Eskom. Many marginal manufacturing businesses have had to close as a result of irregular electricity supply, while the steady increases in tariffs and the associated uncertainty brought about by load-shedding have also deterred new investment.

Second, the country needs to adapt to a future where manufacturing is less top-heavy and 'no longer simply about making products'.<sup>64</sup> Instead, it is increasingly characterised by personalisation and customisation, forcing manufacturers to think beyond optimisation to new ways to generate value.

While economies of scale will still dominate in some areas,<sup>65</sup> the future manufacturing landscape will resemble

a complex ecosystem where the concentration of players is fragmented across an array of value chains run on digitisation and communications technologies. This is a future of 'glocalisation', characterised by shorter value chains with fewer intermediaries and openings for new and smaller market entrants engaged in more distributed small-scale and local manufacturing.<sup>66</sup>

Third, South Africa must overcome the governance challenges that inhibit investment, as discussed previously.

### Agriculture, land reform and water management

The final cluster includes three intervention groups focused on improving agricultural production, reducing food waste and ensuring better water management. The production aspect seeks to break from the historical trend of inequity and inefficiency resulting from elite capture in land reform by focusing on effective land reform in communal areas and of government-owned land. At the heart of such reform is the need for tenure security in the former homelands and the legal transfer of land, as set out in the Constitution.<sup>67</sup>

Such land tenure reform can take the form of individual or communal tenure, but in the case of the latter the Constitution requires the establishment of appropriate elected structures (as opposed to allocating this to chiefs and traditional councils).

The intervention cluster models an increase in land under cultivation, in accordance with spatial estimates of the available state-owned land and former homeland areas that are suitable for cultivation, provided by the Department of Agriculture, Forestry and Fisheries. Agricultural production is improved in the form of yields per hectare through reforms in land administration and improved support for smallholder farmers. Though commercial agriculture is already quite productive in South Africa, continued improvements in yields are possible.

Finally, although a prerequisite for improved production, land tenure security will need additional upstream and downstream measures since small-scale farmers typically have much larger input costs per hectare when compared to large-scale farms. The intervention envisages streamlined value chains and support for on-farm practices that result in less food waste on the farm and in transit to market, modelled through investment in improved road infrastructure in rural areas.

Demand for water is likely to outpace the government's current plans to expand the water supply through projects such as the Lesotho Highlands Water Project. There is thus a need for more groundwater withdrawals – a currently underutilised source – and expanded wastewater treatment. In addition, demand is mitigated by reducing the use of non-revenue water (e.g. through the 'War on Leaks' campaign).

These interventions draw from a previous analysis of South Africa's water supply and demand using IFs.<sup>68</sup>

However, creative water management solutions will still need to be found to fully close the gap, if water use for agriculture is to expand.

Finally, the scenario continues the expansion of aquaculture production that was started under Operation Pakhisa, a proven strategy for supporting food security and creating livelihoods through the oceans economy while reducing overfishing.

Unfortunately, the political and practical obstacles to the pursuit of this scenario are substantive.

In addition to an incomplete legislative framework, the Presidential Advisory Panel on Land Reform and Agriculture lists poor implementation, policy shifts, dwindling budgets, institutional weaknesses and corruption as some of the factors that have stymied progress, 23 years since the release of the White Paper on South African Land policy in 1997.<sup>69</sup>

Politically, reform would require the government to abandon its current pathway, which seeks to strengthen the power of traditional leadership over land and other matters, in favour of policies that could unlock agricultural potential in the former homelands. The result has been a raft of legislation, some of which have run foul of the Constitution.

The political challenge is most prominent in KwaZulu-Natal, which has vested ownership of 2.8 million ha of communal land in the Ingonyama Trust with King Goodwill Zwelethini as its sole trustee. Instead of managing the land on behalf of its occupants, the King has embarked upon a process to usurp their limited rights and maximise income from the Trust, little of which is spent on improving livelihoods or agricultural potential.

## Thuma Mina's impact

By 2044, South Africa's population will have increased by a quarter – from the current estimate of 60 million to around 75 million. In spite of this, the successful implementation of Thuma Mina could increase average incomes by approximately 60% (or US\$8 260) per person between 2020 and 2044. The Current Path forecast is for GDP per capita to grow by only 24% to 2044.

The resulting difference in GDP per capita of around US\$5 000 (roughly ZAR72 200) in 2044 is a clear indication that it is possible for South Africa to regain its economic footing and get on a convergence pathway with that of its peers in the High-Growth MIC and OUMIC groups.

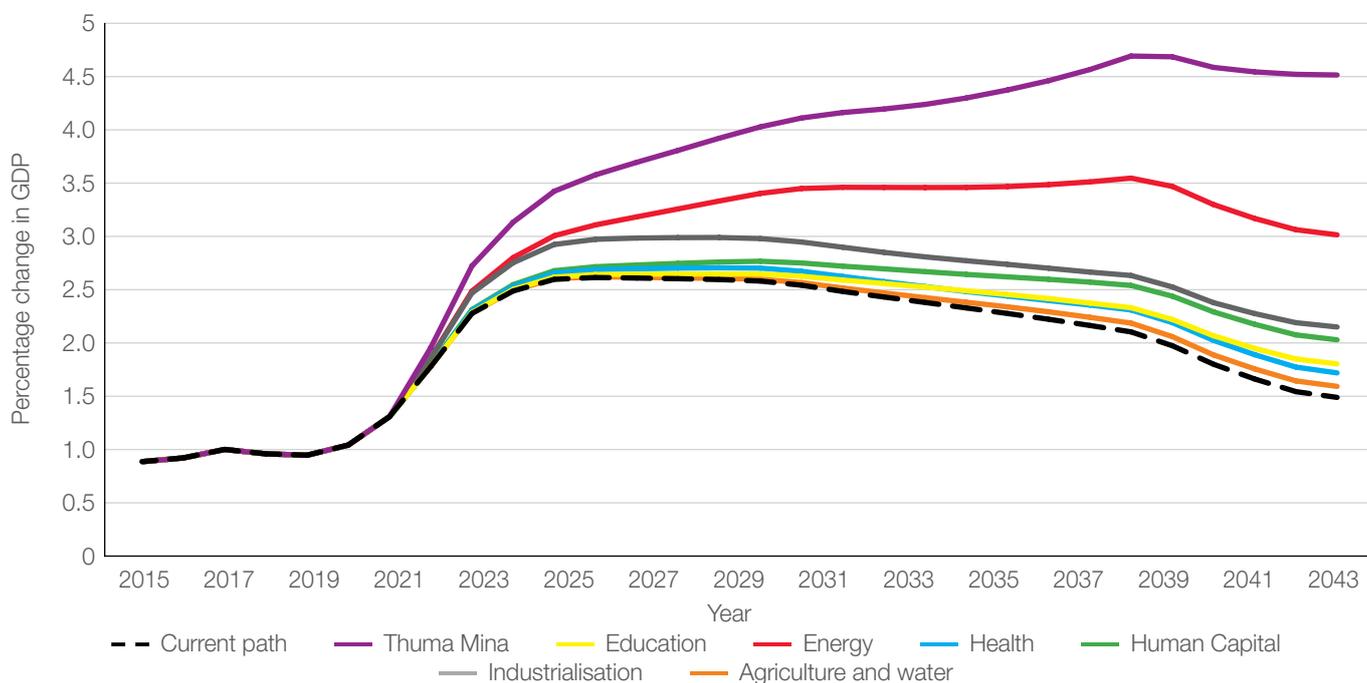
In Thuma Mina South Africa's economy will, by 2044, be over US\$430 billion (more than 30%) larger than the Current Path forecast for that year. Simply put, instead of an economy that increases by 70% from 2020 to 2044, the Thuma Mina economy will have grown by 150%. Moreover, by 2044 South Africans can, on average, expect to live nearly five years longer than in the Current Path forecast, to more than 71 years.

Incomes rise by 60% in the Thuma Mina scenario, compared to 24% on the Current Path

By pursuing a least-cost electricity solution, in 2044 South Africa would release 23 million tonnes *less* carbon than on the Current Path, in spite of a much larger economy. In the Thuma Mina scenario, GDP growth is 1.6 percentage points higher on average over the forecast period, at 3.8% – compared to 2.2% on the Current Path – with improvements in growth gaining momentum over time to consistently exceed 4% in the 2030s and 4.5% in the 2040s.<sup>70</sup>

Notably, the energy scenario cluster does as much to boost growth in the short run as the industrialisation scenario, in which regulatory reform and investment both play a large role in improving the short-term growth outlook. In the long run, though, access to more productive capital that enables a revival in manufacturing and increased trade activity is the clear economic game changer for South Africa.

**Figure 18: GDP growth rate in the Thuma Mina scenario and intervention clusters, compared to the Current Path to 2044 (three-year moving average)**

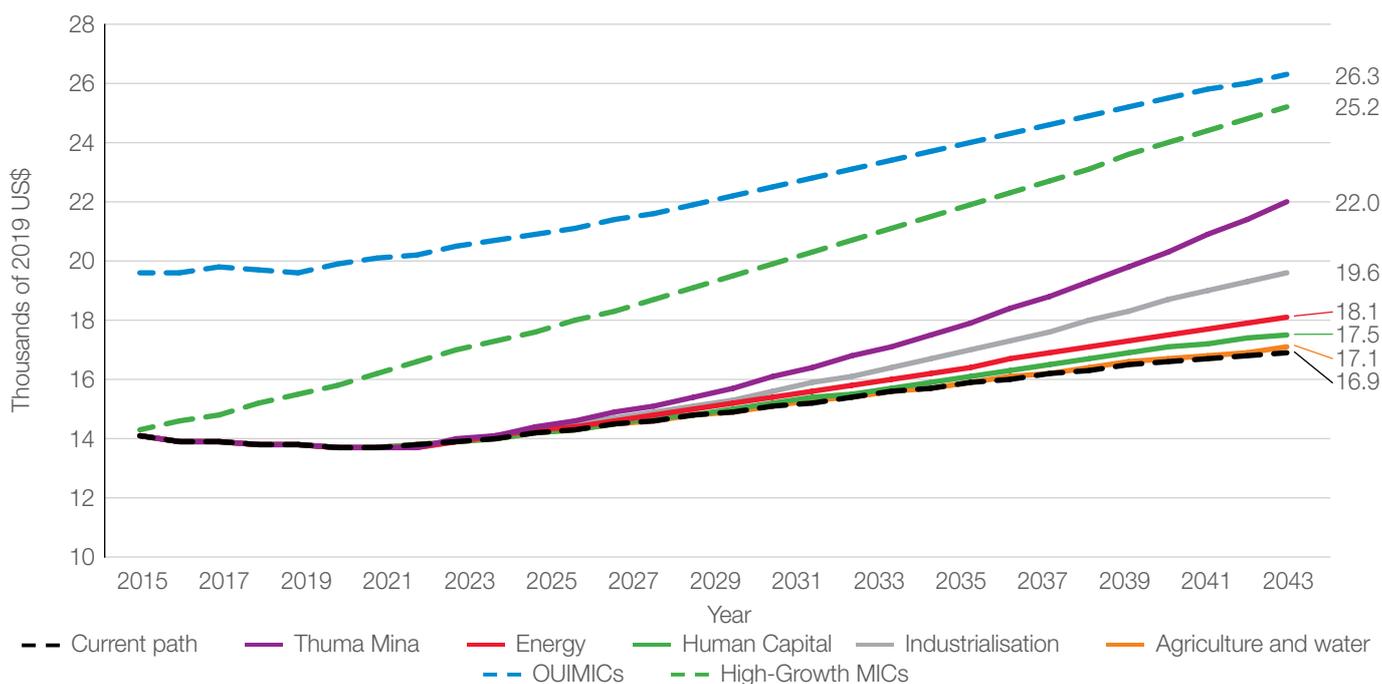


Source: IFs v7.45 initialising from the IMF; growth rate is set exogenously to 2022

The human capital improvements, modelled as the combined health and education scenarios, are about as effective as the energy scenario in supporting growth.

Positive impacts from the human capital interventions are self-reinforcing and support the industrialisation pathway, but it takes longer for them to have an effect.

**Figure 19: GDP per capita in the Thuma Mina scenario and intervention clusters, compared to the Current Path to 2044 and the country peer groups**



Source: IFs v7.45 initialising from the International Monetary Fund; growth rate is set exogenously to 2022

Nevertheless, the quality of life improvements that accompany these interventions make them fundamental to achieving growth that is also inclusive.

In per capita terms, South Africa grows as rapidly on average as the High-Growth MICs in the Thuma Mina scenario, at an average of 1.9% per year, and faster than the OUMICs (1.1% per year). The gap in growth grows considerably over time between the two scenarios, so that the per capita GDP growth rate exceeds 2.5% from the late 2030s onward in Thuma Mina, compared to hovering around one per cent or less on the Current Path in the same period.

This puts South Africa's GDP per capita (at purchasing power parity) at around US\$22 000 (ZAR317 200), compared to less than US\$17 000 (ZAR245 000) on the Current Path (Figure 19). This level of GDP per capita is comparable to that of Bulgaria, Cuba and Mauritius today.

Yet the vision that is realised in Thuma Mina is far from utopian.

### Accessing capital that enables manufacturing and trade is a clear gamechanger for South Africa

Despite GDP per capita growth rates being comparable to that of its upper-middle-income peers, their head start means that South Africa is only just beginning to truly catch up in 2044. In addition, even with the consistently higher growth and a commitment to improving wellbeing, in the Thuma Mina scenario the elimination of poverty is still a distant goal.

The country will have 12% fewer people living in extreme poverty than on the Current Path, but it will still be left with a huge extreme poverty burden of 27 million people living on below US\$5.50 per person per day.<sup>71</sup> While the poverty headcount is reduced by 4 million, more than one in three people is still expected to be living on under US\$5.50 per day in 2044. Continued population growth offsets gains in the percentage of people living in poverty in every intervention cluster aside from the combined Thuma Mina scenario (Figure 20).

When comparing intervention clusters, modern industrialisation and energy transition do particularly well

in terms of both increasing economic productivity and alleviating poverty in the long run, pointing again to the important link between growth and poverty reduction. This result underscores the need to prioritise economic growth as a means of advancing broader social aims in South Africa.

The higher-growth clusters also do less for life expectancy (an important aggregate metric of wellbeing) and human development as measured by the Human Development Index (HDI). Here, the health intervention is especially critical.

The impacts of the Thuma Mina scenario and clusters across these three impact metrics are presented in Table 2, which gives a snapshot of the separate impacts of each of the five sectoral scenarios on six key metrics: income, economic size, inequality, life expectancy, carbon emissions and poverty. It is clear that modern industrialisation (which includes additional investment) and a least-cost energy transition are the most urgently needed to support growth in the short to medium term.

Although the forecasting appears to reflect a weak link between growth and inequality, the IFs system does not currently fully account for the impact of increased levels of employment in the formal sector and the associated impact upon reductions in inequality.

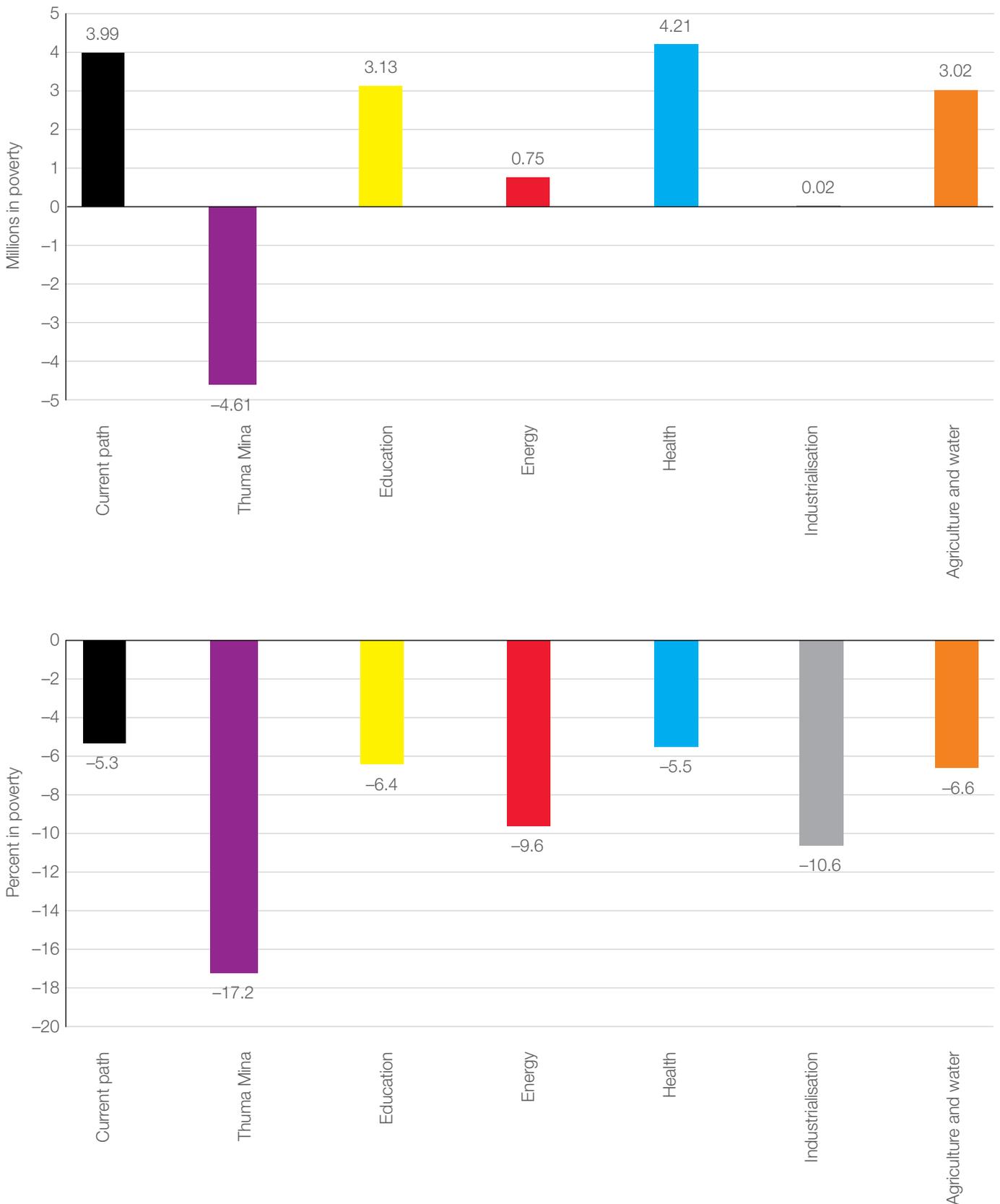
Finally, the agriculture, land reform and water management scenario cluster has notably little economic impact compared to the others. This is mostly because the agriculture sector is very small, and smallholder agriculture even smaller.

Nevertheless, water and land management play central roles both in rural livelihoods and in improving South Africa's resilience to shocks over time.

Importantly, South Africa is expected to become a net food importer on the Current Path, which will expose the food supply to greater vulnerability to supply and price shocks. In the Thuma Mina scenario, this is no longer the case (Figure 21). Likewise, the energy cluster supports a more energy-secure future for South Africa.

However, in the long term, the combined effect of improved health and education outcomes is as valuable as the energy transition in supporting growth, and is central to creating inclusive growth

**Figure 20: Change in poverty headcount and percentage of people in poverty (US\$5.50 line) from 2020 to 2044 in the Current Path, Thuma Mina scenario and intervention clusters**



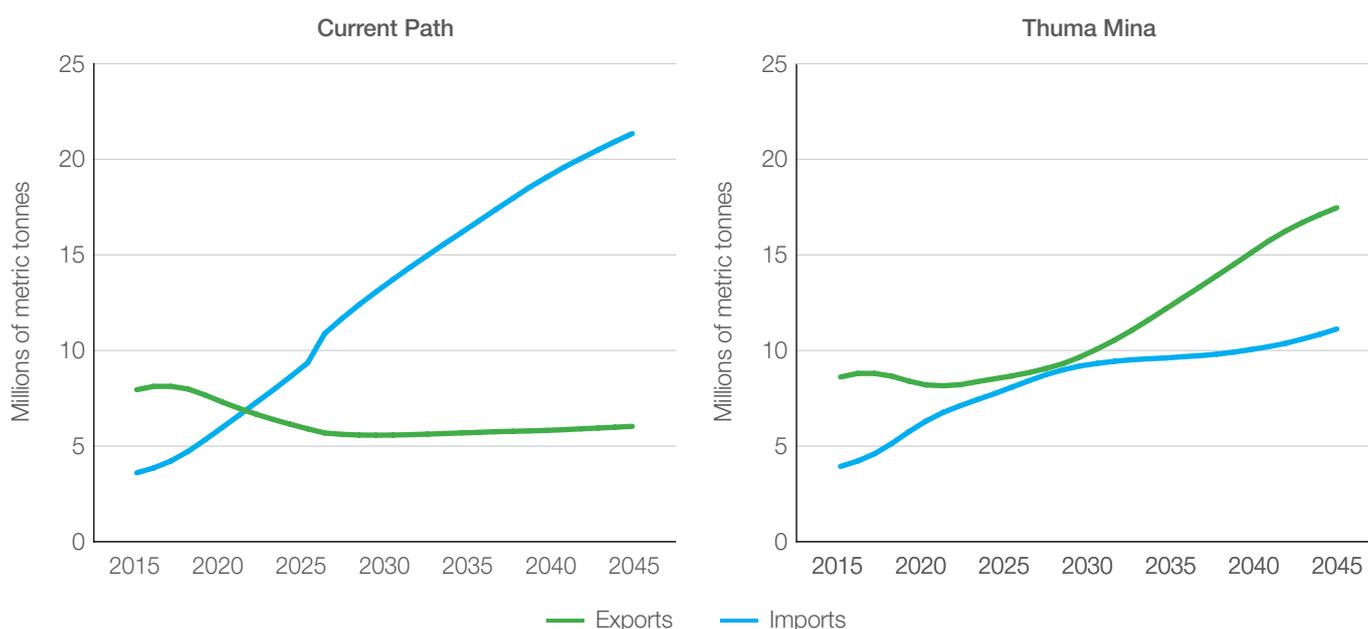
Source: IFs v7.45 initialising from World Development Indicators (World Bank Group)

**Table 2: Impact of the sectorial intervention clusters compared to Current Path, difference in outcome metric values in 2044 (Current Path minus cluster)**

	Education	Energy	Health	Industrialisation	Agriculture and water
Increase in GDP per capita (PPP) – 2019 US\$	353	1 129	228	2 645	114
Increase in GDP (MER) – billions of 2019 US\$	28	92	29	218	9
Reduction in inequality – Gini Coefficient	-0.003	-0.011	0	-0.01	0.001
Increase in life expectancy at birth – years	0.3	0.3	3.8	0.7	0.02
Change in carbon emissions – thousand tonnes of carbon	1 000	-27 000	1 000	5 000	5 000
Reduction in per cent of people in poverty (US\$5.50) – percentage points	-1	-4	-0.2	-5	-1.3

Note: Darker blue indicates more impact, shaded by row.

**Figure 21: Food security on the Current Path and in the Thuma Mina scenario as measured by the balance of crop exports and imports**



Source: IFs v7.45 initialising from the UN Food and Agricultural Organisation

through additional improvements in human development. Recent evidence would suggest that supporting better quality in these systems is key, and this analysis supports that assertion, especially in the case of education.

Table 2 also illustrates the extent to which appropriate policy choice and implementation can help to realise significantly better development

outcomes, and put South Africa on a trajectory of convergence with its country peers. That would be a huge change from the Current Path forecast, which is one of increased divergence, with South Africa falling further behind its peers.

From this stronger Thuma Mina base, South Africa will also be more resilient to future crises and better able to make the most of new opportunities.

### Box 3: Potential game changers

In two rounds of consultative workshops with issue-area experts, rapid technological change consistently emerged as a potential game changer. If adopted and effectively employed, emerging technologies could be instrumental in advancing human development. In health, precision and genomic medicine, health data analytics and shared record systems, nanotechnology, 3-D printing, and the Internet of medical things are all examples of technologies that could revolutionise healthcare around the world as part of the Fourth Industrial Revolution.<sup>72</sup>

Meanwhile, the speed, degree and effectiveness of the integration of education technology (EdTech) into the education system are central to success in a true education evolution. The relationship between technology and education is a feedback loop in which technology both creates the demand for educational reform and enables this reform to be realised.

The Fourth Industrial Revolution demands that the contents of education curriculums change to prepare young people for a wholly tech-driven economy in which digital literacy and the ability to learn new skills over a lifespan is the new normal. At the same time, technology, if effectively deployed, can improve access to cheaper and better education.

This global shift is being reflected in EdTech investment globally, which reached US\$16.34 billion in 2018, led by China and the US and followed by India and Israel.<sup>73</sup>

For South Africa, the question is how well technologies can be integrated into healthcare service delivery, particularly in rural areas, and how it will affect traditional infrastructure such as brick-and-mortar educational institutions. The high penetration of cellular technology gives South Africa a good start. However, this is just the beginning, and additional challenges, such as cybersecurity and regulatory compliance, will emerge as education and healthcare become more technology-driven.

Moreover, while technological change promises to revolutionise productivity, it also threatens to worsen inequality within and between countries.<sup>74</sup> It is not clear whether the policy environment is conducive to enabling these promising trends to improve human wellbeing without compromising human rights and security. Critically, there is a need to foster more collaborative approaches to adapting to the Fourth Industrial Revolution, including between the public and private sectors.

Countries cannot truly plan for the range of possible futures that technological change is creating, but they can place themselves in a better position to be able to benefit from changes as they unfold.

South Africa has a history of being an early adopter with clear advantages like a relatively advanced R&D sector for the region and foundational ICT infrastructure such as a growing fibre network (in the absence of movement in spectrum allocation) that is bringing down the cost of high-speed connectivity for all.<sup>75</sup>

## Conclusion

This report used analysis drawing from the IFs modelling platform to present the drag that key factors – including electricity constraints, low levels of investment, high levels of crime and violence, and policy uncertainty – have on the country's prospects for growth in the short to medium term.

Looking out to 2044, South Africa must aspire to much better education and health outcomes if it is to change its current mediocre long-term growth forecast. Yet these investments in addressing its considerable human capital-based productivity challenges, while essential, will have little impact on growth for at least the next decade.

Change to South Africa's Current Path prospects will require deliberate choices, determined implementation, leadership and some pain.<sup>76</sup> More immediate progress depends on ramping up renewables as a pathway to modern industrialisation and significantly higher levels of investment in the economy.

It is clear that current policies and approaches will not achieve the results that South Africa needs. It is concerning that basic solutions such as the consistent selection and appointment of highly qualified leadership in government remain lacking.

Talk is cheap, and many if not all of the critical reforms needed to put South Africa on a more positive growth pathway are under active discussion in the political sphere and society more broadly, even as urgent action and implementation remains wanting.

Central to the slow progress is the constant requirement for consultation among the factions within the ruling African National Congress (ANC) and the broad church that constitutes the tripartite alliance (which also consists of the Congress of South African Trade Unions and the South African Communist Party).

Evidence, not ideology, must drive decision-making, rooted in an honest accounting of the present reality and the implications of that reality for the future.

This should be provided by a government and research community that actively engages with the leadership of the ANC towards evidence-based policy formulation and bridges the current ideological divide and siloed thinking.

A pro-growth approach also requires the governing party, government, labour, business and decision makers across the political spectrum to collaborate to build accountability and appoint the best brains to manage the economy, including at SOEs. South Africa needs a broad-ranging compact between all key stakeholders in each of the five areas modelled in this report if it is to break its slow growth trap.

There is no simple solution that could place South Africa on a sustained Thuma Mina convergence pathway with either the OUMICs or High-Growth MICs. It will take several decades of continued effort to achieve the vision set out in the country's now outdated National Development Plan.

## Evidence, not ideology, must drive decision-making

Recent events such as the 2018 and 2019 South Africa Investment Conferences<sup>77</sup> and policies such as the 2019 White Paper on Science, Technology and Innovation<sup>78</sup> have demonstrated a commitment to improving the climate for investment and innovation. However, achieving sustained, inclusive growth is possible only to the extent that South Africa can offer a reliable supply of electricity, rein in its reliance on dysfunctional SOEs and move towards a more flexible, pro-growth approach to the economy that embraces the necessary governance reforms.

Under both the Current Path and Thuma Mina scenarios, fiscal consolidation will require cutbacks on government expenditure for several years. At the same time, reductions in capital expenditure would further reduce growth.

Since social grants (at approximately 4.25% of GDP in 2019/20) have an important distributional effect for the bottom 40% of households, the only way out for the government is to reduce the provincial and local government salary bills, which have seen the largest increases in recent years and allow for additional cutbacks in the procurement of goods and services.<sup>79</sup> These findings closely align with the government's stated intent to reduce its public sector wage bill over time.

Finally, South Africa has to find a pathway towards greater social, economic and political cohesion. There is, in the recent words of Prerna Singh, ‘a large, if inchoate scholarship on how an inclusive nationalism has historically been an important force driving state provision of public goods’.<sup>80</sup>

While this report supports governing from an evidence base, it does not advocate a merely technocratic approach. Governing for all South Africans also requires the vision to do so. There is no absence of efforts in

this regard; the most recent is the Indlulamithi project that aims to further social cohesion and identifies the elements of a common vision for South Africa.<sup>81</sup>

Adopting an inclusive and nuanced class-based interpretation of society is fundamental to a new vision for South Africa. Otherwise, it will remain trapped in ‘that irresistible temptation ... to divide all kinds of things into two distinct and often conflicting groups, with an imagined gap – a huge chasm of injustice – in between’.<sup>82</sup>

## Acknowledgements

The authors would like to extend their appreciation to Prof. Philippe Burger from the University of the Free State, Dr Mohammad Irfan and colleagues at the Frederick S Pardee Center and Duma Gqubule from the Centre for Economic Development and Transformation for their consultation and comments; Prof. Morné Mostert and colleagues from the Institute for Futures Research at Stellenbosch University, who were kind enough to partner in the hosting of a second workshop in Bellville in December 2019; Dr Jarrad Wright for his invaluable consultation on the energy modelling; a host of experts on land and agriculture; and Zachel van Aswegen and the African Futures and Innovation Team. And finally, thanks to all workshop participants who offered their time and insights to this project.

## Annex 1: Summary of modelled interventions

### Current Path interventions

Intervention group	Intervention	Quantification for intervention
Population	Increase migration rate to a more likely level	Migration is adjusted to track estimates produced for the CSIR Green Book publication using the SPECTRUM model; approximately 330 000 net migrants are added per year above the Base Case forecast.
Health	Match AIDS deaths forecast to Thembisa Model	Historical data and forecast are adjusted to match Thembisa model v4.2.
Economy	Peg 2020–2022 GDP growth rate to IMF forecast, taking CSIR’s forecasted energy shortfall into account	Exogenously input short-term growth rate to a level that is somewhat below that forecasted by the IMF to account for the drag on growth that is anticipated from load-shedding through 2022, based on forecasts from CSIR.
Energy	Match renewables production to IRP 2018	South Africa’s energy mix approximates that set out in the Oct 2019 Integrated Resource Plan, then continues on a moderate pathway to 2044, where renewables reach around 50% of production and overtake coal around 2040.

## Health cluster interventions

Intervention group	Intervention	Quantification for intervention
Social determinants of health	Reduce adult obesity	Reverse the trend in rising adult obesity so 24% of adults are obese in 2044, compared to 34% on the Current Path; this is a strong improvement, though SA is still higher than the High-Growth MICs (16% in 2044).
	Reduce child malnutrition	The proportion of malnourished children is more than halved by 2044, from around 6.5% to 3%, to reach the OUMICs, which do better than the High-Growth MICs; the Basic Infrastructure intervention supports this outcome.
	Reduce deaths from traffic accidents	Arrest growth in the number of deaths from traffic accidents and begin to reduce it toward the High-Growth MICs' level of .22 per thousand population in 2044.
	Reduce deaths from violence	Halt an expected increase in the death rate from intentional injuries (homicides and suicides) to 2030, then reduce by 25% by 2044.
Basic infrastructure	Increase clean water access	South Africa maintains 95% safe water access to 2030, and reaches 99% access by 2044.
	Increase improved sanitation access	South Africa improves its trajectory on access to improved sanitation at the household level to reach the High-Growth MICs in 2033, then continues improvements in line with the group to 2044.
Child and maternal health	Reduce maternal mortality	The maternal mortality rate is reduced significantly from around 121 deaths per 1 000 live births to 30; this is still above the High-Growth MICs average in the same year of around 14, but on a par with several OUMICs such as Colombia, Senegal and Brazil.
	Reduce child (under 5) mortality from communicable diseases	The under-five mortality rate is reduced from 7.5 deaths per 1 000 live births to 2, to approximate the High-Growth MICs' level in the same year. The Basic Infrastructure intervention supports this outcome.
Premature mortality	Arrest growing premature death rate from leading non-communicable diseases	Slow the expected growth in death rates from the leading causes of premature mortality: cardiovascular disease, cancer, diabetes, 'other' non-communicable diseases. Intervention starts in 2026 to simulate the implementation of NHI, and reduces death rates to 15–20% lower than the estimated rate for 2044 on the Current Path. This roughly reflects the proportion of deaths that were found could be prevented through universal access to quality healthcare in a group of middle-income countries, including South Africa. <sup>63</sup> For communicable diseases, the death rate is reduced more rapidly to converge with peers, given these types of illnesses are more amenable to intervention.
	More rapidly reduce deaths from 'other' communicable diseases (incl. tuberculosis)	

## Education cluster interventions

Intervention group	Intervention	Quantification for intervention
Education Throughput	Increase the lower secondary graduation rate	Rate of graduation from lower secondary (passing grade 10) reaches 87% by 2030 and 97% by 2044, to reach the High-Growth MICs; this puts SA among the global leaders for improvements in lower secondary graduation.
	Increase the upper secondary graduation rate	South Africa improves its upper secondary (passing matric) graduation rate to 2044 to reach the 85% seen in High-Growth MICs. While aggressive, SA is not the only country with a 60% graduation rate or above that is able to achieve this change in the forecast.
Tertiary education	Increase the tertiary enrolment rate	South Africa increases its tertiary enrolment by over 15 percentage points to 37% from 20% by 2044, or seven percentage points higher than on the Current Path. This is ten percentage points lower than the High-Growth MICs, but poor access and quality at lower levels of education limit further room for improvement.
	Increase the tertiary graduation rate	South Africa improves its tertiary graduation rate by around 25 percentage points to reach the High-Growth MICs average of 34%.
	Increase the proportion of tertiary students in STEM fields	South Africa increases the proportion of students in STEM to meet the High-Growth MICs in 2030 (21%), then tracks with the group's progress to exceed 22% in 2044.
Education quality	Increase primary school quality as measured by test score	South Africa's education quality reaches the level in the High-Growth MICs by 2030, then tracks the group's progress to 2044.
	Increase secondary school quality as measured by test scores	South Africa's education quality reaches the average for the High-Growth MICs by 2044; this makes it a leading performer globally for test score improvements in upper secondary.
Vocational training	Increase participation in vocational training in upper secondary school	A directed push to increase vocational training to 2030 raises it to 15.5% of students enrolled in 2030 from 11.5%, then further to 22.5% in 2044; this is an appreciable increase toward the High-Growth MICs average of around 33%.

## Energy cluster interventions

Intervention group	Intervention	Quantification for intervention
Renewables production	Continue renewables uptake on an aggressive pathway beyond IRP	South Africa's energy mix reaches that set out for electricity in the Oct 2019 Integrated Resource Plan in 2030, and the momentum in renewables continues such that they constitute 63% of energy production in 2044, on track to reaching CSIR's recommended target of 70% renewables for electricity production in 2050.
Gas production	Match gas production to IRP, then sustain level of gas production	Gas production grows to 6% of energy production by 2030 and hovers around 10% of production between 2035 and 2044.
Employment	Increase labour force participation rate	Investment in transitioning to the green economy creates new jobs in energy by 2030 in line with CSIR expectations and boosts total employment in line with McKinsey estimate of effective transition toward a smooth transition toward the digital economy; total addition of 1.2 million new jobs by 2030 (labour force participation increase). Positive momentum continues to 2044 such that the labour force participation rate is 54.5%, compared to around 49% on the Current Path, 54% in OUMICs and 59% in High-Growth MICs.

## Industrialisation cluster interventions

Intervention group	Intervention	Quantification for intervention
Investment	Increase FDI inflows as a percentage of GDP, using both inflows and stocks	FDI inflows reach 3.8% of GDP by 2030, catching up to average for the High-Growth MICs, then tracks with the group to 2044.
	Increase the amount of domestic investment in the economy	Domestic investment as a per cent of GDP reaches 29.5% of GDP to match the level sustained in the High-Growth MICs by 2037 (from a range of 20–22% from 2015 to 2019), and tracks with the group to 2044.
R&D	Increase total R&D spending	Spending on R&D increases steadily to reach the benchmark for the White Paper on Science, Technology and Innovation of 1.5% of GDP by 2030. Thereafter it rises by an additional percentage point to 2040 to 2.5% of GDP.
Trade	Export growth as a result of promotion of exports in manufacturing	Trade and investment accelerate manufacturing exports, especially in the latter half of the forecast to over 16% of GDP in 2044 (compared to 13% today).
	Export growth as a result of promotion of exports in ICT	Trade and investment accelerate ICT exports, especially in the latter half of the forecast to over 0.5% of GDP in 2044 (compared to 0.3% today).
Ease of doing business	Reduce regulation on business	South Africa is among the 10 countries that most reduce the level of regulation on business to 2044, others include China, India, Laos and Cambodia. Government regulatory quality is improved as a result, to approximate the High-Growth MICs by 2044.
	Increase economic freedom	SA improves its economic freedom score to reach a level that is on par with the High-Growth MICs by 2044.
Strengthen digital infrastructure	Increase access to fixed broadband	Increase access to fixed broadband to 45 per 100 people in 2044, up from fewer than five today and 29 on the Current Path to meet the average for OUMICs, which perform better on this metric than the High-Growth MICs.
	Increase number of households with Internet access (fixed and mobile)	South Africa has universal access to the Internet (fixed or mobile) at the household level by 2031 rather than 2044.

## Land and water cluster interventions

Intervention group	Intervention	Quantification for intervention
Production	Yield increase	South Africa improves its crop yields per hectare, yields increase from 4.6 in 2019 to 6.8 2044 to reflect improvements in the homelands; this is a level of yields on par with countries such as Nigeria and Serbia in 2044 and just above that seen in the High-Growth MICs (6.6).
	Increase land under cultivation	There is an expansion of land used for crop of around one million hectares by 2035 and just over 1.5 million by 2044. This is a conservative estimate of unused land potentially available for cultivation in the former homelands and in state ownership taken from figures provided by the Department of Agriculture, Forestry and Fisheries.
	Increase aquaculture production	South Africa's aquaculture production increases by just over 100% (112.5%), in line with the 34 fastest-growing countries for aquaculture across the forecast period that all double their production; this is built on progress to date due to Operation Pakhisa, which has grown aquaculture by five-fold since 2014 (by 20 000 tonnes).
Loss/waste	Reduction in agriculture losses (transmission)	South Africa reduces its agricultural losses to 8.5 mil tonnes per hectare (from 10) by 2030 and holds that level constant to 2044; production losses account for the largest portion of reduction, and transmission losses account for the second-largest portion.
	Reduction in agriculture losses (production)	
Water	Increase land area equipped for irrigation	Interventions draw from previous modelling work by the ISS that closes the gap between water supply and demand by reducing the consumption of scarce surface water resources, and increasing use of groundwater and recycled wastewater. Land area equipped for irrigation is aggressively increased by around 100 000 hectares to 2023 then gradually adds an additional 75 000 hectares to 2044. <sup>84</sup>
	Increase wastewater treatment and reuse	
	Increase groundwater extraction	
	Reduce in surface water extraction	

## Annex 2: Summary of data updates for South Africa

Series updated	Module	Source	Source link
Government debt as a per cent of GDP	Government Finance	International Monetary Fund – External Debt Database	<a href="https://www.imf.org/external/datamapper/CG_DEBT_GDP@GDD/ZAF">https://www.imf.org/external/datamapper/CG_DEBT_GDP@GDD/ZAF</a>
R&D as a per cent of GDP – total and government	Government Finance	Human Sciences Research Council – South African National Survey of Research and Experimental Development: main report 2016/17	<a href="http://www.hsrc.ac.za/en/research-data/view/9828">http://www.hsrc.ac.za/en/research-data/view/9828</a>
Government expenditure, spending on social programmes	Government Finance	International Monetary Fund – Government Finance Statistics database	<a href="https://data.imf.org/?sk=89418059-d5c0-4330-8c41-dbc2d8f90f46&amp;slid=1435762628665">https://data.imf.org/?sk=89418059-d5c0-4330-8c41-dbc2d8f90f46&amp;slid=1435762628665</a>
HIV and AIDS mortality series, including high, low and medium estimates	Health	Center for Actuarial Studies at the University of Cape Town – Thembisa model version 4.2	<a href="https://www.thembisa.org/downloads">https://www.thembisa.org/downloads</a>
Electricity (national, urban, and rural) and Internet access (national)	Infrastructure	Department of Planning, Monitoring, and Evaluation – Development Indicators	<a href="https://www.dpme.gov.za/keyfocusareas/outcomesSite/Pages/Development-Indicators.aspx">https://www.dpme.gov.za/keyfocusareas/outcomesSite/Pages/Development-Indicators.aspx</a>
Road paving and network length	Infrastructure	South African Bituminous Coal Association (SABITA) – Roads Review Reports	<a href="https://www.sabita.co.za">https://www.sabita.co.za</a>

Series updated	Module	Source	Source link
Electricity production and electricity share of total energy demand	Infrastructure	Council for Scientific and Industrial Research – Setting up for the 2020s (report data)	<a href="https://researchspace.csir.co.za/dspace/handle/10204/11282">https://researchspace.csir.co.za/dspace/handle/10204/11282</a>
Various demographic series, such as total population, total fertility rate, and life expectancy by gender	Population	Stats SA – Mid-year Population Estimates 2019	<a href="http://www.statssa.gov.za/?page_id=1854&amp;PPN=P0302&amp;SCH=7668">http://www.statssa.gov.za/?page_id=1854&amp;PPN=P0302&amp;SCH=7668</a>
Household count	Population	Stats SA – General Household Survey 2019	<a href="http://www.statssa.gov.za/?page_id=1854&amp;PPN=P0318.2&amp;SCH=7653">http://www.statssa.gov.za/?page_id=1854&amp;PPN=P0318.2&amp;SCH=7653</a>
Gini coefficient	Socio-economic	Stats SA - Poverty Trends in South Africa: An examination of absolute poverty between 2006 and 2015 (2017 report)	<a href="https://www.statssa.gov.za/publications/Report-03-10-06/Report-03-10-062015.pdf">https://www.statssa.gov.za/publications/Report-03-10-06/Report-03-10-062015.pdf</a>
Economic freedom	Socio-economic	Fraser Institute	<a href="https://www.fraserinstitute.org/economic-freedom/dataset">https://www.fraserinstitute.org/economic-freedom/dataset</a>
Various education series, to bring up to date, such as completion and vocational training by level and gender	Education	UNESCO Education Statistics database (UIS. stat)	<a href="http://data.uis.unesco.org/#">http://data.uis.unesco.org/#</a>

### Annex 3: Country groups

Group name	Other upper-middle income countries (OUMICs)	High-growth middle-income countries (High-Growth MICs)
Criteria	World Bank country lending groups, 2019/20 upper-middle-income classification is US\$3 996 to US\$12 375	Middle-income countries with a GDP per capita growth rate of at least 2% from 2009 to 2018 (compared to below 1% for South Africa); GDP per capita of US\$10 000 or greater at purchasing power parity in 2018 (compared to US\$12 140 for South Africa); 'Polity Score' of 11 or higher as measured by the Center for Systemic Peace's Polity IV Project
Country list	Albania, Algeria, Argentina, Armenia, Azerbaijan, Belarus, Belize, Bosnia, Botswana, Brazil, Bulgaria, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Equatorial Guinea, Fiji, Gabon, Georgia, Grenada, Guatemala, Guyana, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kosovo, Lebanon, Libya, Macedonia, Malaysia, Maldives, Mauritius, Mexico, Montenegro, Namibia, Paraguay, Peru, Romania, Russia, Samoa, Serbia, Sri Lanka, St Lucia, St Vincent and the Grenadines, Suriname, Thailand, Tonga, Turkey, Turkmenistan, Venezuela	Albania, Bosnia, Botswana, Bulgaria, Colombia, Costa Rica, Georgia, Indonesia, Kosovo, Macedonia, Malaysia, Mauritius, Mongolia, Montenegro, Paraguay, Peru, Romania, Serbia and Sri Lanka
Notes	Excludes South Africa and China	Created by authors with input from second consultative workshop

## Notes

- 1 The Thuma Mina slogan originated in 2018 as the election campaign of the governing African National Congress (ANC) and was subsequently taken up in President Cyril Ramaphosa's inaugural State of the Nation Address. It is the title of a song by renowned South African artist Hugh Masekela.
- 2 The benchmarking used for calibration of the interventions is based on academic literature, past trends and expected values in the variables analysed in South Africa and comparable country cases. Input was also provided by experts in the five fields of interest during an extensive process of individual and collective consultation during the third and fourth quarters of 2019.
- 3 See, among others, J Cilliers, *Fate of the nation: three scenarios for South Africa's future*, Johannesburg and Cape Town: Jonathan Ball, 2017.
- 4 World Bank Country and Lending Group and historical classification by income are available at World Bank, World Bank country and lending groups, <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519>
- 5 They score on the top half of the Polity Score, meaning all are either anocracies or democracies, as measured by the Center for Systemic Peace's Polity IV Project. According to the Center for Systemic Peace, "the "Polity Score" captures this regime authority spectrum on a 21-point scale ranging from -10 (hereditary monarchy) to +10 (consolidated democracy). The Polity scores can also be converted into regime categories in a suggested three part categorization of "autocracies" (-10 to -6), "anocracies" (-5 to +5 and three special values: -66, -77 and -88), and "democracies" (+6 to +10)." See <https://www.systemicpeace.org/polityproject.html>
- 6 The IFs system uses 2011 US\$ that was converted to 2019 US\$ using a conversion rate of 1.14 from the Bureau of Labour Statistics (US). See <https://data.bls.gov/cgi-bin/cpicalc.pl?cost1=1.00&year1=201112&year2=201912>
- 7 Average of monthly exchange rates for 2019 from x-rates.com, see <https://www.x-rates.com/average/?from=USD&to=ZAR&amount=1&year=2019>
- 8 A middle-income country is classified as being in the MIT once it has passed a certain temporal threshold, most commonly 49 years. See C Wang and J Lan, *Inequality, aging, and the middle income trap*, Asian Development Bank Institute, 2017, <https://www.adb.org/publications/inequality-aging-and-middle-income-trap>
- 9 See 'US\$ values and comparative groupings' above for an explanation of grouping.
- 10 JR Wright and JG Calitz, *Setting up for the 2020s: addressing South Africa's electricity crisis and getting ready for the next decade*, Council for Scientific and Industrial Research (CSIR) Energy Centre, 2020, <http://hdl.handle.net/10204/11282>
- 11 International Monetary Fund (IMF), South Africa, <https://www.imf.org/en/Countries/ZAF>
- 12 For example, see PE Robertson and L Ye, *On the existence of a middle income trap*, University of Western Australia, 2013, <http://ssrn.com/abstract=2227776>; J Felipe, A Abdon and U Kumar, *Tracking the middle-income trap: what is it, who is in it, and why?*, Hudson, NY: Levy Economics Institute of Bard College, 2012.
- 13 Results differ between sources and methodologies. The World Development Indicators (WDI) have the size of South Africa's services sector at 61.3% of GDP, manufacturing at 11.8%, and agriculture, forestry and fishing at 2.2% in 2018. In addition, IFs estimates that the informal services sector currently comprises around 13% of GDP. See World Bank, World Development Indicators, <http://datatopics.worldbank.org/world-development-indicators/>
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This publication was produced with the financial support of the Hanns Seidel Foundation, the European Union and the Swedish International Development Cooperation Agency. Its contents are the sole responsibility of the authors and do not necessarily reflect the views of the Hanns Seidel Foundation, the European Union or the Swedish International Development Cooperation Agency. The ISS is also grateful for support from the members of the ISS Partnership Forum: the Hanns Seidel Foundation, the European Union and the governments of Canada, Denmark, Finland, Ireland, the Netherlands, Norway, Sweden and the USA.

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