McKinsey&Company

MCKINSEY GLOBAL INSTITUTE

SOUTH AFRICA'S BIG FIVE: BOLD PRIORITIES FOR INCLUSIVE GROWTH

SEPTEMBER 2015

APPENDIX: TECHNICAL NOTES

MCKINSEY GLOBAL INSTITUTE
CELEBRATING 25 YEARS OF INSIGHT

MCKINSEY GLOBAL INSTITUTE

In the 25 years since its founding, the McKinsey Global Institute (MGI) has sought to develop a deeper understanding of the evolving global economy. As the business and economics research arm of McKinsey & Company, MGI aims to provide leaders in the commercial, public, and social sectors with the facts and insights on which to base management and policy decisions.

MGI research combines the disciplines of economics and management, employing the analytical tools of economics with the insights of business leaders. Our "micro-to-macro" methodology examines microeconomic industry trends to better understand the broad macroeconomic forces affecting business strategy and public policy. MGI's in-depth reports have covered more than 20 countries and 30 industries. Current research focuses on six themes: productivity and growth, natural resources, labor markets, the evolution of global financial markets, the economic impact of technology and innovation, and urbanisation.

Recent reports have assessed global growth; the economies of Brazil, Mexico, Nigeria, and Japan; China's digital transformation; India's path from poverty to empowerment; the effects of global debt; and the economics of online talent platforms and the labor market.

MGI is led by three McKinsey & Company directors: Richard Dobbs, James Manyika, and Jonathan Woetzel. Michael Chui, Susan Lund, and Jaana Remes serve as MGI partners. Project teams are led by the MGI partners and a group of senior fellows, and include consultants from McKinsey & Company's offices around the world. These teams draw on McKinsey & Company's global network of partners and industry and management experts. In addition, leading economists, including Nobel laureates, act as research advisers.

The partners of McKinsey & Company fund MGI's research; it is not commissioned by any business, government, or other institution. For further information about MGI and to download reports, please visit www.mckinsey.com/mgi.

MCKINSEY & COMPANY IN AFRICA

McKinsey opened its first African office in Johannesburg in 1995, soon after South Africa's new democracy brought Nelson Mandela to power. Across Africa, McKinsey is playing an active role in the continent's economic rebirth, making a difference to both individual clients and whole countries. We have more than 300 consultants working across the continent. From our offices in Johannesburg, Lagos, Luanda, Addis Ababa, Morocco and Nairobi, we have completed more than 2,200 engagements over the past 20 years—in more than 40 countries, including South Africa, Nigeria, Morocco, Angola, Tunisia, Tanzania, Kenya, Zambia, Gabon, Namibia, Ethiopia, Ghana, Cote d'Ivoire, Togo, and Senegal. For more information, please visit www.mckinsey.com/insights/middle_east_and_africa.

SOUTH AFRICA'S BIG FIVE: BOLD PRIORITIES FOR INCLUSIVE GROWTH

SEPTEMBER 2015

Acha Leke | Johannesburg

David Fine | Johannesburg

Richard Dobbs | London

Nomfanelo Magwentshu | Johannesburg

Susan Lund | Washington, DC

Christine Wu | Johannesburg

Paul Jacobson | Johannesburg

APPENDIX: TECHNICAL NOTES

This technical appendix is a supplement to the McKinsey Global Institute report *South Africa's big five: Bold priorities for inclusive growth*, which is available online at www.mckinsey.com/insights/mgi. This appendix outlines key elements of the methodology used in the report, along with the major data sources and assumptions adopted. It first discusses the approach, data sources and assumptions for the report's overall modelling of growth, employment, and GDP impact. It then sets out the methodology, data sources, and assumptions for each of the "big five" sectors covered in the report—advanced manufacturing, infrastructure, natural gas, service exports, and agriculture. Finally, it outlines the approach adopted to arrive at the calculations contained in the final chapter, on equipping South Africans for the jobs of the future.

1. OVERVIEW OF APPROACH USED FOR EACH OF THE CROSS-CUTTING CALCULATIONS

Reporting of values in rand and US dollars

In this report, where possible, we have reported all figures in both South African rand and US dollars. The rand values were converted to dollars using a factor of 11.52 rand per dollar for 2015.

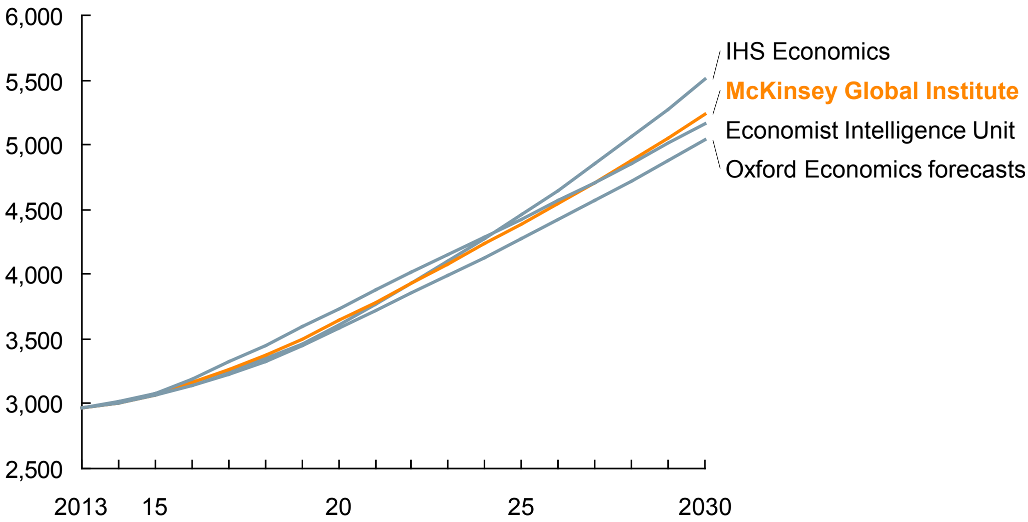
GDP consensus forecasts

We consolidated growth forecasts until 2030 from three sources: the Oxford Economics forecasts, The Economist Intelligence Unit, and IHS Economics. We then consolidated and averaged the projections to arrive at a consensus forecast to 2030, as the baseline view of GDP growth (Exhibit A1).

Exhibit A1

Our baseline forecast for South African GDP growth is in the middle of a range of forecasts

Forecast for real GDP growth through 2030
Billion rand, 2010 prices



SOURCE: Oxford Economics forecasts; The Economist Intelligence Unit; IHS Economics; McKinsey Global Institute analysis

---

Estimating the value added and job creation potential of the big five priorities

To estimate the impact of each opportunity, we start by estimating the impact on revenue in the case of exports (manufacturing, services, and agriculture) and new industries (natural gas), and expenditure in the case of infrastructure. We then convert this to the impact on GDP by applying value-added multipliers calculated using an input-output table for the South African economy (from the mid-2000s). The estimation includes the impact on value added from the initial change, from the effect on suppliers, and from consumer spending induced by the increased production (and hence wages). The impact is typically more than the initial change to sales or output, except in cases where the industry evaluated relies heavily on imports. An example is the automotive industry, in which the value-added impact of each rand exported is smaller than 1 because most of the components are imported and then assembled in South Africa. An assumption inherent in this analysis is that the pattern of imports and exports in a supply chain will remain unchanged. Several opportunities may alter this, however, particularly in manufacturing, and so our estimate of the value added of manufacturing may be conservative.

We employ a similar analysis to measure job impacts economy-wide, where the increased revenue is used to estimate the jobs created in a particular sector and among its suppliers, as well as those created from induced spending.

An analytical challenge in estimating the jobs impact of each opportunity lies in accounting for improvements in sector productivity. To deal with this, we have not used a jobs multiplier table, which is derived from the same input-output tables mentioned above, to determine broader job impact on the economy. Instead we have used an approach that corrects for productivity levels at the sector level. This approach is as follows:

- We modelled increased productivity levels for each sector to 2020 and 2030 using a sector productivity growth rate.[1] This productivity growth rate per sector was derived from a set of countries that achieved a GDP growth trajectory similar to the one that forecasts indicate South Africa will achieve.[2] This growth trajectory starts at South Africa's current GDP per capita in PPP of $12,454 and ends at the anticipated GDP per capita of 2030 (a range of $22,000 to $26,000 per capita PPP).[3] The five countries in the data set (and the period over which they experienced this growth) are Morocco (2000 to 2013), the Korean Republic (1990 to 2005), Malaysia (1993 to 2015), Estonia (1996 to 2007), and Poland (2000 to 2013). The countries achieved this growth over an 11- to 22-year period, which is similar to South Africa's aspiration.

- The value added for the estimated increase in revenue or expenditure levels for each opportunity in 2020 and 2030 was calculated based on initial impact figures in the input-output tables.

- Jobs created in the sector were calculated using this expected value added and the forecast productivity levels in 2020 and 2030. Jobs created in the broader economy were calculated based on the difference between output and value added for the relevant sector's inputs, multiplied by the overall economy's productivity level, also for 2020 and 2030.

We acknowledge three potential pitfalls in this approach, which uses a relatively simple method to calculate job creation. The first is that it does not account for jobs lost due to imports in the supply chain, and so may somewhat overestimate jobs created. Second, we undertook a broad estimation of the impact on the overall economy and did not use the multiplier approach. Third, the broader economy estimate does not account for different rates of productivity improvement for different sectors, and so provides an aggregated estimate of broader economic impact.

1 Sectors include agriculture, manufacturing, construction, transport, storage and communication, mining and quarrying, personal services, utilities, retail, government, and finance and business services.

2 This is accelerated growth of 4 to 5 percent per year. This exceeds the consensus forecast but would be realised if South Africa does unlock some of the opportunities this report discusses.

3 *World development indicators*, World Bank, April 2015. All values in real 2011 prices.

2. ADVANCED MANUFACTURING: CREATING A GLOBAL HUB

Calculation of impact on GDP

To calculate the potential impact on GDP of growing the advanced manufacturing industries, we estimated market demand growth by region and estimated how much South Africa could capture of this growth, based on its historical performance in those markets.

We started by calculating a forecast of the demand for all manufactured products classified as "global innovation for local markets" (key advanced industries, as discussed in previous MGI research).[4] We used growth rates provided by IHS Economics for each region over the period to 2030, in a forecast model we developed. Global demand growth was estimated separately for 17 categories of products in the period to 2030, across seven geographical regions: sub-Saharan Africa, the Southern African Development Community (excluding South Africa), North Africa and the Middle East, Asia-Pacific, Europe, Latin America, and North America.

We then calculated South Africa's 2013 market share of imports into all countries globally. We used figures for both total imports and South African imports as reported by individual countries rather than the reported export figures from South Africa, which often did not match the import figures reported by the partner. We estimated the potential organic growth into each region based purely on South Africa's existing market share into those regions.

We also estimated South Africa's potential market share growth in each region by setting a benchmark market share for each region. We calculated the benchmark as the top decile of South Africa's market share across all countries in that region. The rationale was that if South Africa is able to successfully penetrate a product market in a region, it should eventually be able to penetrate other markets in that region to the same extent because of similar competition, transportation costs, regional trade agreements, culture, and needs for goods. (Differences between the trade environments within these regions exist but were impractical to adjust for.) Based on this, we were able to estimate what South Africa could be exporting in total to each region if it could achieve benchmark market shares of imported products into those countries. This was then the basis for the estimated increase in exports by product and in total, along with the relevant growth rates.

We calculated the overall potential for South Africa by adding the organic growth and the new regional market shares in 2020 and 2030. Because it is unlikely that South Africa would reach the new market shares immediately, we incorporated a ten-year ramp-up period. We used World Bank World Integrated Trade Solution data for export levels and market-share calculations. The IHS Economics database provided regional growth rates for each category of manufactured product, and the IHS World Industry Service database provided GDP deflators and currency exchange rates. All analyses were undertaken using level two categories: for example, chemicals are divided into organic chemicals, inorganic chemicals, fertilisers, etc. We applied multipliers to convert the output to value added at the same granular level. Multipliers ranged from 0.84 for motor vehicles (with a high degree of imported component parts) to 1.17 for fabricated metal products, with an average multiplier of 1.03 for all the assessed advanced manufacturing opportunities.

---

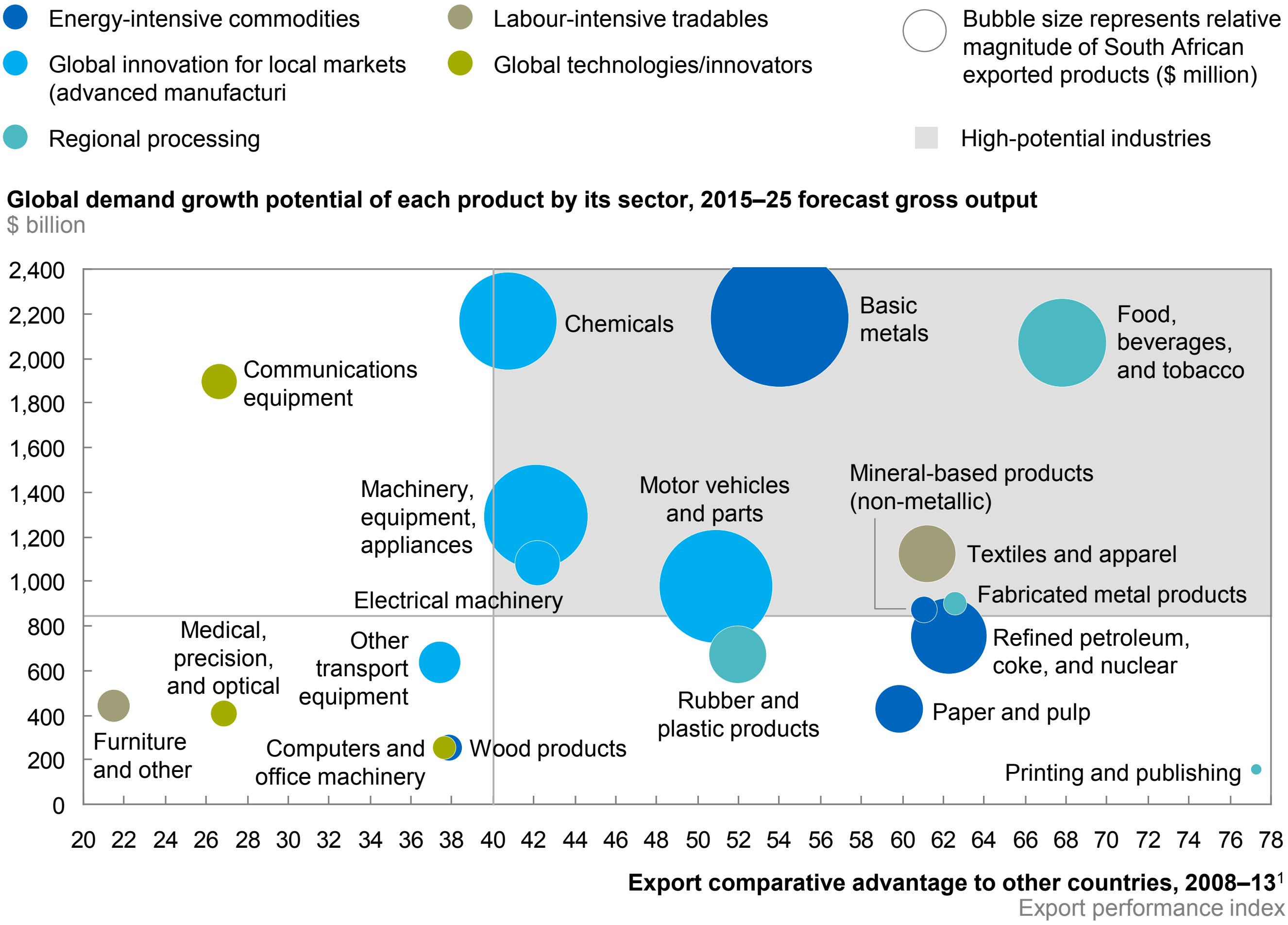
4 *Manufacturing the future: The next era of global growth and innovation*, McKinsey Global Institute, November 2012.

Calculation of revealed comparative advantage

Revealed comparative advantage is an index used in macroeconomics that estimates a country's comparative advantage in producing a product based on its proportional export of that product relative to the proportional export of that product in for all other countries in the rest of the world (Exhibit A2).

Exhibit A2

Growth potential and comparative advantage in manufactured exports



1 Indicates the extent to which South Africa exports this product compared the extent that other countries do.

SOURCE: IHS Economics; ITC Trade Map; Export Promotion Assessment Tool; McKinsey Global Institute analysis

We calculated it as:

$$\frac{\left(\dfrac{\text{Exports of product X from South Africa}}{\text{Total exports from South Africa}}\right)}{\left(\dfrac{\text{Exports of product X from the rest of the world}}{\text{Total exports from the rest of the world}}\right)}$$

A value greater than 1 indicates the South Africa has a comparative advantage: it exports more of the product on average than would be expected given global export trends.

Growth from core vs. adjacent products

South Africa's total global manufactured export data and total global manufactured import data was analysed and categorised into core and adjacent products for 2013 exports and imports.[5] In South Africa's exports data, adjacent products made up only 31 percent of the total exports, while adjacent products accounted for 58 percent of global imports. Assuming South Africa achieved the global average of 58 percent by 2030, then these adjacent products would account for 411 billion rand ($35.7 billion) of the total 713 billion rand ($62 billion) in advanced manufacturing exports, compared to 59 billion rand ($5.1 billion) of 192 billion rand ($16.7 billion) in exports in 2013. That would account for two-thirds of the estimated growth in advanced manufacturing products.

[5] *Exports of industry product* and *Imports of industry product, real,* IHS Global Insights database, February 2015.

3. INFRASTRUCTURE: PARTNERING FOR PRODUCTIVITY

In the infrastructure chapter, we analyse current infrastructure spend levels, forecast spend levels to 2020, and estimate how much infrastructure spend is required for a country like South Africa. Then we estimate how much increased construction productivity could reduce spend levels and the economic impact of investing those savings into the economy in the long term. In this case we assumed that the savings would go into more infrastructure, but that will not necessarily happen. The jobs impact estimate is based on investing additional funds that would previously not have been used productively.

Calculation of historical spend levels, required spend levels, and infrastructure stock

MGI typically analyses national infrastructure spend levels as a percentage of a country's GDP as a way to benchmark spend levels. In this report, this analysis utilised McKinsey's Infrastructure Stock and Spend (ISS) database for historical data. The ISS database showed that South Africa's infrastructure spend levels as a percentage of GDP came to 4.9 percent from 1992 to 2012.

We then updated this finding with the latest South African National Treasury budget (for the cycle until 2017/18, announced in February 2015).[6] This document outlines 813 billion rand (nominal), or $70.6 billion, in expenditure for the three-year period starting in 2015 (all numbers have been analysed on a real 2010 prices basis). The ISS database considers the four major asset classes: energy, water and sanitation, transport and logistics, and telecommunications. The analyses were performed on these four asset classes, and the findings extrapolated to the full spend. Together, these four asset classes accounted for 82 percent of South Africa's total budgeted infrastructure spend from 2012 to 2017.

Because the National Treasury's budget runs only until 2017/18, we extrapolated the spend levels from 2018/19 to 2025/26 to estimate spend over the next decade. For the purposes of this analysis, we decided to maintain the historical spend level at 4.9 percent. In order to maintain this spend level, annual expenditure on infrastructure needs to increase by 4 percent per year in real terms. This helps correct for a slight drop-off in spend levels in 2016 and 2017 and for depreciation of 2.5 percent per year. Based on this extrapolation, South Africa needs to spend 2.2 trillion rand ($191 billion) over a decade, or 220 billion rand ($19.1 billion) per year. South Africa spent 191 billion rand ($16.6 billion) in 2014/15 (in real 2010 prices). If spend levels grow at 0 percent per year in real terms, infrastructure spend as a proportion of GDP will fall to 3.6 percent by 2030 (Turkey's historical level of spend), and the forecast spend to 2025 will be 1.8 trillion rand ($156.3 billion) instead of 2.2 trillion rand ($191 billion).

An underlying assumption here is that South Africa's fiscal position is unchanged and that the country can continue to fund infrastructure at this level of GDP over the next decade. In the report, we indicate that this will be challenging, given the country's fiscal situation leading into 2015; this means that the recommendations of this report to increase infrastructure productivity will be important to help maintain this spend level.

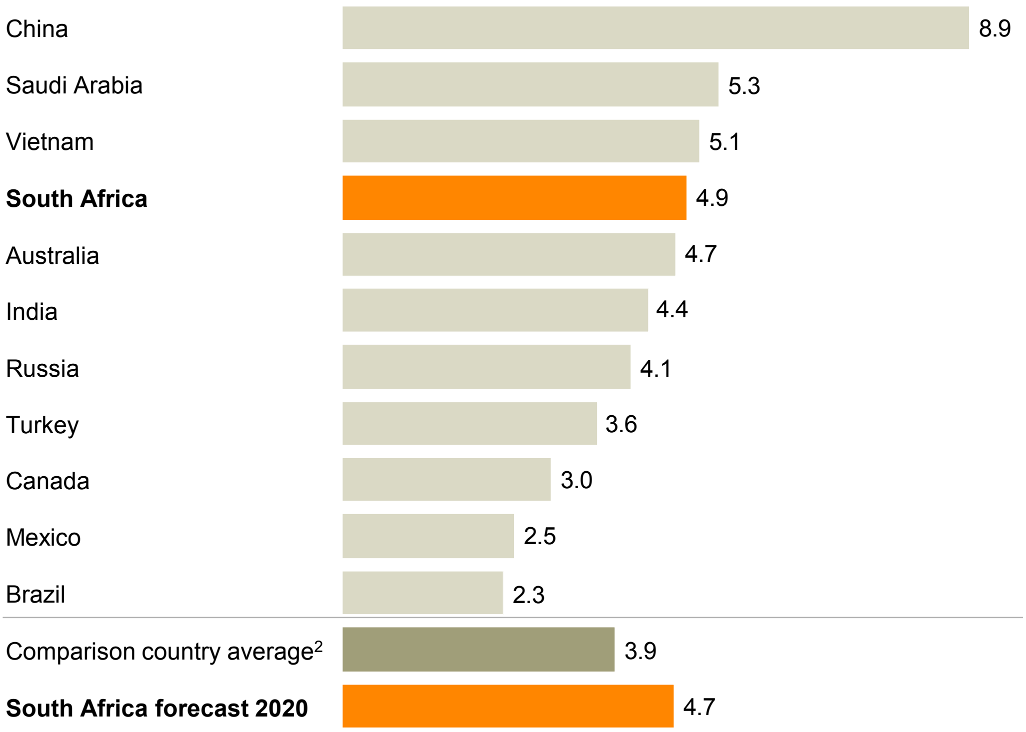
6 *Budget Review 2015*, National Treasury, February 25, 2015.

Building on the 4.9 percent historical spend estimate, our estimate of spend until 2020 comes to 4.7 percent (Exhibit A3). Due to year-by-year fluctuations—2015 spend levels were 5.2 percent of GDP, while 2017 spend levels are forecast to be 4.1 percent of GDP—the long-run average and the 2020 average are not exactly the same.

Exhibit A3

South Africa's infrastructure spend level exceeds that of most other economies

Infrastructure spend as percentage of GDP, 1992–2012[1]



1 Considers only the four major asset classes—power, water, telecom, and transport.
2 Average excludes South Africa and China.

SOURCE: RSA National Treasury; PwC South Africa; McKinsey Global Institute analysis

We also calculate South Africa's infrastructure stock levels using McKinsey's ISS database. The working assumption is that countries should invest annually in infrastructure to maintain stock at 70 percent of GDP growth plus depreciation. This benchmark is the average across a group of large advanced and emerging economies, including the United Kingdom, Canada, the United States, Germany, Spain, Italy, China, India, Poland, and South Africa (of 75 countries globally, eight are in Africa). This also happens to be the current level of Germany's infrastructure stock. In South Africa, the average infrastructure stock level as a proportion of GDP level was 67.9 percent at the end of 2012—very close to the benchmark level. Based on the working assumption, South Africa's required infrastructure spending level to maintain its stock is the GDP growth rate to 2030 (3.6 percent) plus a depreciation factor (2.5 percent), multiplied by 70.6 percent, which comes to 4.3 percent. In other words, South Africa needs to spend 4.3 percent of its GDP on infrastructure each year until 2030 to reach and maintain an infrastructure stock level of 70 percent of GDP.

Estimating the direct supply-side GDP effect of greater capital stock

Since South Africa already spends slightly more than is notionally required on infrastructure (4.7 percent infrastructure spend as percentage of GDP compared to a requirement of 4.3 percent of GDP to reach and maintain an appropriate infrastructure stock level), this report focused on achieving greater value from the same spend levels by boosting productivity. Earlier MGI work indicated that approximately 40 percent of spend could be saved or reduced by focusing on the productivity levers discussed in this report.[7] We applied this ratio in two ways. First we assessed how much could be saved if these productivity levers were applied to the forecast 2.2 trillion rand ($191 billion) spend. Improving productivity will yield the same long-run GDP impact as spending 2.2 trillion rand because the delivered impact in the long run will be the same, but for lower expenditure. Therefore, in addition to the baseline impact of the projected 4.8 percent spend per year to 2030, an additional 1.9 percent was added (40 percent of the 4.8 percent).

Second, we applied these productivity levers to the infrastructure spend level suggested by the National Development Plan (NDP), 10 percent of GDP.[8] We estimate that this would come to a cumulative 3.7 trillion rand ($321.2 billion) invested in infrastructure by 2025, or 1.5 trillion rand ($130.2 billion) more than budgeted, on average 370 billion rand ($32.1 billion) per year. This 10 percent includes more than the major four classes of infrastructure (accounting for 82 percent of all spend in South Africa). When additional asset classes are taken into account, South Africa's infrastructure spend levels as a percentage of GDP are 5.9 percent, so 4.1 percent more would have to be spent to reach NDP levels. In a similar manner as before, we applied the approximately 40 percent saving to this additional 4.1 percent spend, which means saving 1.5 percent of this expenditure per year (40 percent of the 4.1 percent). We then assumed that this saving would also be invested in more infrastructure.

For the direct supply-side effect, we assessed the impact of expanding infrastructure beyond the baseline spend levels, first by 1.9 percent. We calculated the additional, accumulated new infrastructure stock net of depreciation, based on projected GDP and the additional annual infrastructure investment of 1.9 percent of GDP. We repeated this calculation where we invested the total potential savings in infrastructure. In this case it was the 1.9 percent savings of the 2.2 trillion rand ($191 billion) spend levels, plus the 1.5 percent savings of the 3.7 trillion rand ($321.2 billion) spend levels, for a total saving of 3.4 percent. We then calculated the cumulative impact on infrastructure stock, based on first the 1.9 percent additional investment, followed by the 3.4 percent additional investment, taking into account an annual depreciation rate of 2.5 percent (from an infrastructure stock level in 2012 of 67.9 percent of GDP). This gives us a range of impact potential, with 1.9 percent additional investment at the lower end and 3.4 percent additional investment at the higher end.

The current infrastructure budget would increase infrastructure stock to 77 percent of GDP by 2030, while the lower investment case (1.9 percent, investment as percent of GDP) would increase stock to 95 percent, and the higher case (3.4 percent, investment as percent of GDP) would increase stock to 109 percent. This is an additional 905 billion rand ($78.6 billion) in stock in the lower case and an additional 1.6 trillion rand ($139 billion) in stock in the higher case by 2030. These increases in infrastructure stock are well above the 70 percent benchmark level mentioned earlier, and this is a sign of South Africa investing in its future growth. However, not all of this spend necessarily has to go into infrastructure; it may be more than is required. Some of this money might be better invested in other parts of the economy, but we did not model for that.

---

7 *Infrastructure productivity: How to save $1 trillion a year,* McKinsey Global Institute, January 2013.

8 *National development plan: Vision for 2030*, National Planning Commission, November 11, 2011.

The impact of these two increments in productivity is not linear, because the higher infrastructure stock level starts to have diminishing returns on long-run GDP, as can be seen from the output elasticity of public capital work equation from Bom and Ligthart (2008), which we used as the basis of our calculations.[9] From this, we estimated the marginal productivity of the infrastructure, or the rate of return on the infrastructure investment, for each year. We assume a non-linear relationship and therefore use the following formula. In this equation, θ is the output elasticity and *ΔPublic capital* is the annual additional invested capital:

$$\Delta \text{GDP}_t = \theta \times \Delta \text{Public capital}_t \times \left(\frac{\text{GDP}}{\text{Public capital}} \right)_t$$

We estimated that the annual direct effect from expanding the infrastructure stock by the lower case (1.9 percent of GDP to 2030) will equal 163 billion rand ($14.1 billion), and that the effect of expanding the stock by the higher case (3.4 percent of GDP) to 2030 will equal 258 billion rand ($22.4 billion). We estimate that the planned 2.2 trillion rand ($191 billion) spend by South Africa without any productivity improvements will increase GDP by 616 billion rand ($53.5 billion) in 2030. So the productivity levers increase the baseline GDP impact by 42 percent; South Africa will essentially get 42 percent more GDP impact for spending the same money.

Estimating jobs impact

The baseline spend levels of 2.2 trillion rand ($191 billion) over a decade, or 220 billion rand ($191 billion) per year, were assumed to contribute sustainable jobs every year. Using the job creation analysis described at the start of this appendix, we estimated that this would create approximately 540,000 jobs directly in the construction industry and 490,000 additional jobs in the broader economy. The savings derived from productivity came to 37.9 percent of this 220 billion rand ($191 billion), or 83 billion rand ($7.2 billion) that could be invested in additional infrastructure. This would create an additional 204,000 jobs in construction and an additional 186,000 jobs in the broader economy. The same productivity savings were applied to the NDP's goals for increased spending. The additional spending aspired to, is 1.5 trillion rand ($130.2 billion), or 150 billion rand ($13 billion) per year. Applying the productivity savings of 37.9 percent, we estimated that 57 billion rand ($5 billion) could be saved and invested in additional infrastructure. This would create an additional 139,000 jobs in construction and an additional 127,000 jobs in the broader economy.

Calculation of maintenance spending shortfall

We estimate that South Africa underspends on maintenance of infrastructure by 49 billion rand ($4.3 billion) per year. To arrive at this estimate, we first benchmarked from two sources what we thought South Africa should spend on maintenance. Then we estimated what it appears South Africa does spend on maintenance. We came up with a deficit range of 49 billion to 109 billion rand ($4.3 billion to $9.5 billion) per year.

The first estimate used the National Infrastructure Maintenance Strategy guidelines for maintenance budget as a percentage of replacement cost.[10] This budget breaks down maintenance by asset type, and this was used, with the National Treasury breakdown of infrastructure spend for 2014/15, to arrive at a weighted average maintenance spend level of 5.4 percent of expenditure rate. This was then multiplied by the value of South Africa's infrastructure. The value of South Africa's infrastructure was estimated as the product of the

[9] See Pedro R. D. Bom and Jenny E. Ligthart, *How productive is public capital? A meta-analysis*, CentER and Department of Economics, Tilburg University, January 2008.

[10] *National Infrastructure Maintenance Strategy (NIMS): Infrastructure maintenance budgeting guideline*, Construction Industry Development Board, January 2008.

infrastructure stock level, 67.9 percent of GDP, and the GDP estimate for 2014 of 3.8 trillion rand (nominal), or $330 billion, to come to 2.6 trillion rand ($225.7 billion). The maintenance required on 2.6 trillion rand ($225.7 billion) therefore comes to 138 billion rand ($12 billion) per year.

The second estimate is sourced from Rioja (2001), who suggests an optimal maintenance spend level of 2 percent of GDP, based on an analysis of seven Latin American countries.[11] We scaled this value for South Africa, which has higher infrastructure stock levels than most Latin American countries. As a proxy to scale against, we used the two largest Latin American countries by GDP, Mexico and Brazil.[12] Mexico has 45.9 percent infrastructure stock as a proportion of GDP, and Brazil 29.7 percent. The average infrastructure stock as a proportion of GDP is therefore 37.8 percent, compared to South Africa's 67.9 percent, so the 2 percent for Latin America was proportionally scaled up to 3.6 percent. Multiplying this by the GDP of South Africa in 2014, 3.8 trillion rand (nominal), or $330 billion, indicates that maintenance spend should be 137 billion rand ($12 billion), closely aligned to the first estimate.

Next we estimated what South Africa actually spends on maintenance. We looked at its two major state-owned enterprises first. Eskom's maintenance and repairs spend is 22 percent of its capital spend: 12.9 billion rand ($1.1 billion) on net repairs and maintenance costs, divided by its capital expenditure of 58 billion rand ($5 billion) in 2013/14.[13] Transnet's maintenance spend is 59 percent of its capital expenditure: 16.2 billion rand ($1.4 billion) on maintenance, divided by 27.5 billion rand ($2.4 billion) on capital expenditure in 2013/14.[14] The weighted average for these two organisations is 34 percent. We also estimated current spend by government departments on maintenance for departmental infrastructure. The National Treasury Budget Review indicates that 11.4 percent of expenditure on departmental infrastructure was spent on maintenance, repairs, rehabilitation, and refurbishment.[15] Applying this range of 11.4 percent to 34 percent to the budgeted 262 billion rand ($22.7 billion) expenditure for 2014/15 gives a maintenance spend estimate range of 30 billion to 89 billion rand ($2.6 billion to $7.7 billion). This is a shortfall of 49 billion to 109 billion rand ($4.3 billion to $9.5 billion) based on the benchmark.

[11] Felix K. Rioja, "Filling potholes: Macroeconomic effects of maintenance versus new investments in public infrastructure", *Journal of Public Economics*, volume 87, issues 9–10, September 2003.

[12] *World development indicators*, World Bank, 2015. Assessed in 2013.

[13] *2014 Integrated annual report*, Eskom.

[14] *Integrated report 2013*, Transnet, May 2013.

[15] *Budget Review 2015*, National Treasury, February 25, 2015.

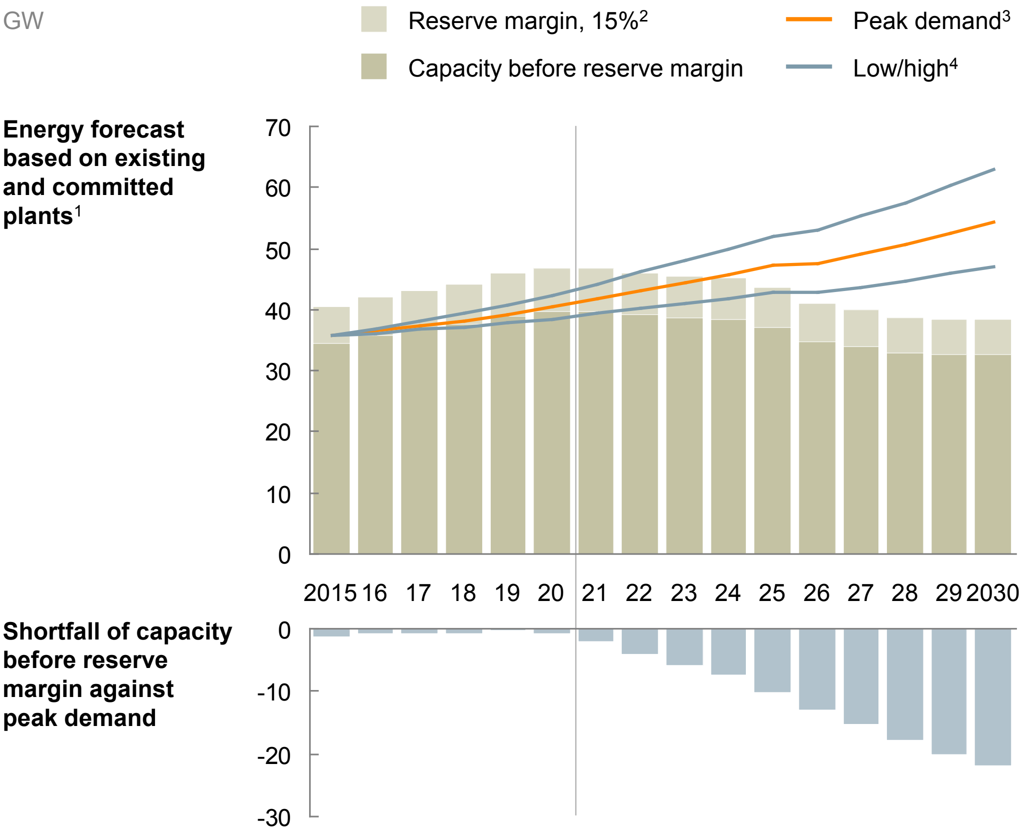
4. NATURAL GAS: POWERING SOUTH AFRICA'S FUTURE

Estimating potential power demand

As the starting point for this analysis, we compared South Africa's peak available power capacity against peak demand (Exhibit A4). Peak available capacity reflects installed capacity multiplied by an availability factor, i.e., the proportion of time during which plants could provide power to the grid. The installed capacity is based on the information outlined in the Department of Energy's Integrated Resource Plan of 2013. We account for existing capacity, decommissioned capacity, and committed new plants. We assume an availability factor of 80 percent for non-renewables (based on Eskom's average availability factor target) and 30 percent for renewables (the average of wind and solar technologies, as estimated by the US Energy Information Administration).[16] We then subtract a reserve margin—a measure of available capacity that is used to meet spikes in average peak demand or as insurance against sudden losses. In South Africa, the Department of Energy recommends a reserve margin of 15 percent of available capacity, and internationally, reserve margins range between 10 percent and 20 percent.[17] In our base analysis, we show a reserve margin of 15 percent.

Exhibit A4

New power plants will be required after 2020 to balance demand and supply



1 Includes Medupi and Kusile. Assumes an availability factor of 80% for non-renewables and 30% for renewables.
2 The South African Department of Energy recommends a reserve margin of 15% of peak capacity.
3 2014 peak demand, escalated at the growth rate set out in the Integrated Resource Plan.
4 Plus or minus 1% growth from the base case.

SOURCE: Department of Energy Integrated Resource Plan; McKinsey Global Institute analysis

16 *2014 integrated annual report, Eskom*; *Annual Energy Outlook,* US Energy Information Administration, 2014.

17 *Integrated resource plan for electricity (IRP) 2010–2030: Update report*, Republic of South Africa Department of Energy, 2013; Energy Vortex.

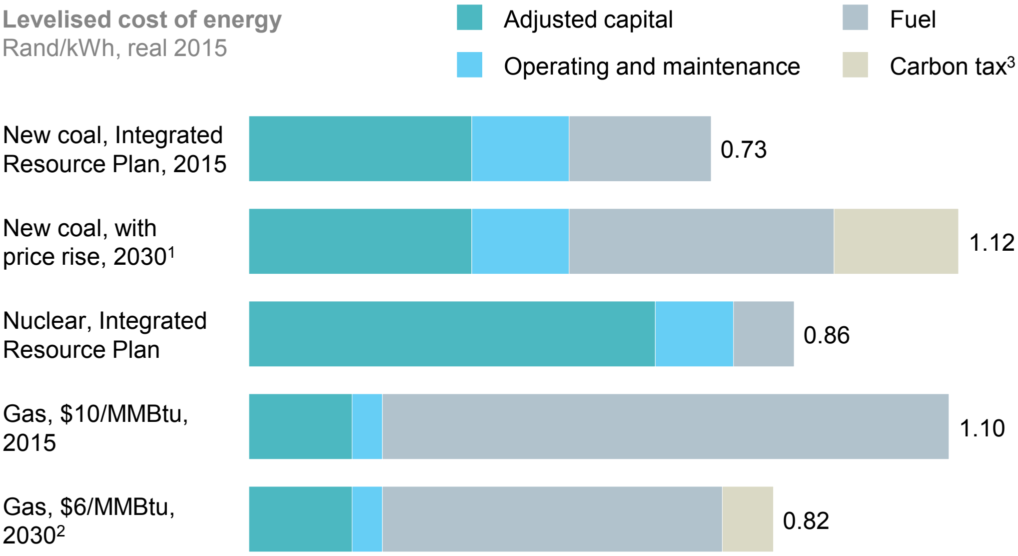
We calculate peak demand based on average 2014 peak demand, escalated at the growth rate set out in the Integrated Resource Plan 2013 *Update report* (an average of 2.8 percent to 2030). In comparison, GDP growth over this period is expected to average 3.6 percent, but given that the structure of South Africa's economy is moving towards tertiary sectors, we expect growth in power demand to be lower than GDP growth. Given the uncertainty associated with demand forecasts, we also consider low and high peak demand scenarios, by adding or subtracting one percentage point to or from the growth rate.

Levelised cost of energy

We rely on the South African Department of Energy's estimates of levelised cost of energy production (LCOE).[18] We also consider further LCOE cases for coal and gas power in which we change the assumptions on input costs (Exhibit A5). In both cases, we change only the fuel component of LCOE. For coal, we assume that domestic coal prices will rise 87 percent in real terms to 2030, or 4 percent per year. This analysis is based on Eskom's forecasts.[19] For gas, we assume that in the long term, gas prices could drop to $6 per million British thermal units (in comparison to $10, which the initial LCOE is based on).

Exhibit A5

Gas power is more expensive than coal but will become more competitive as coal prices rise, gas prices fall, and carbon taxes are implemented



1 Assumes coal costs rise by 87% to 2030, per Eskom.
2 Gas price unlikely to drop below $10/MMBtu until after 2030.
3 Carbon tax is based on 120 rand/ton CO_2 equivalent in 2016, escalated at 10% annually in nominal terms to 2030.

SOURCE: Department of Energy Integrated Resource Plan; Eskom; National Energy Regulator of South Africa; McKinsey Global Institute analysis

We have also taken carbon taxes into account. South Africa is expected to introduce carbon taxes in 2016, at a price of 120 rand ($10) per tonne CO_2 equivalent, escalated at 10 percent per year in nominal terms. In our analysis, this escalation was continued until 2030 to reach 456 rand per tonne CO_2 equivalent, or 207 rand ($18) in 2015 prices. Using the assumption that new combined cycle gas turbine plants produce less than half the carbon emissions new coal plants produce (388 kilograms per megawatt hour, compared with 947 kilograms for coal), we estimated that the carbon tax would be 0.08 rand per kilowatt hour for

[18] *Integrated resource plan for electricity (IRP) 2010–2030: Update report*, Department of Energy, Republic of South Africa, 2013.

[19] *Part 1 revenue application: Multi-year price determination 2013/14–2017/18 (MYPD 3)*, Eskom, October 17, 2012.

combined cycle gas turbine plants and 0.20 rand per kilowatt hour for all coal plants, in 2015 prices. We determined aggregate LCOEs for the two energy mix scenarios by weighting the power produced from each energy type, and then applying the appropriate LCOE to determine a final weighted average.

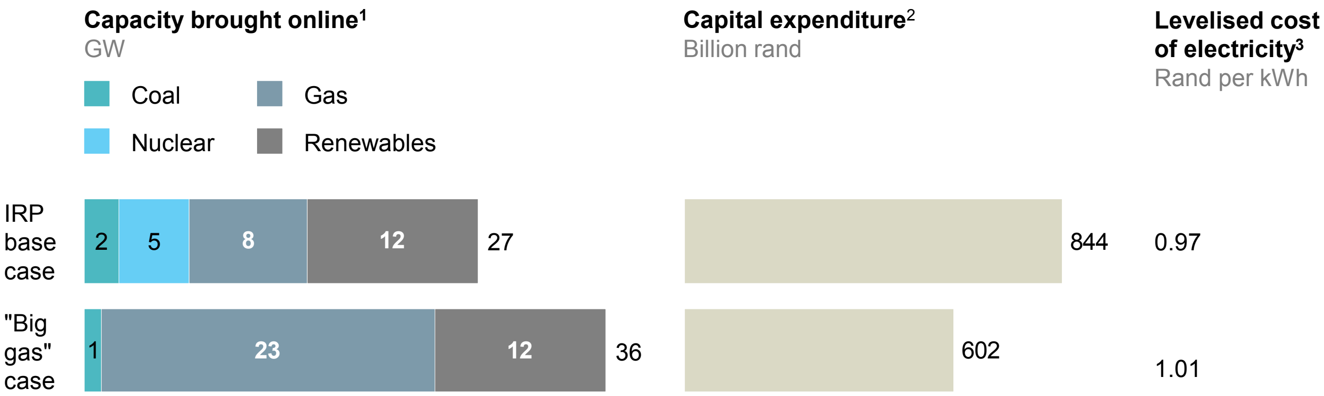
Estimating capital expenditure

We multiplied the various elements of installed capacity by capital costs per kilowatt to determine total capital expenditure (Exhibit A6). All capital expenditure is reported in real 2015 terms. We assume capital costs per kilowatt of 31,481 rand ($2,733) for coal, 70,891 rand ($6,154) for nuclear, 5,706 rand ($495) for open cycle gas turbine, 8,659 rand ($752) for combined cycle gas turbine, 19,477 ($1,691) rand for wind, and 35,596 rand ($3,090) for solar photovoltaic.[20]

Exhibit A6

We recommend pursuing a "big gas" approach to meeting South Africa's energy needs from 2015 until 2030

Energy mix: Integrated Resource Plan (IRP) base case vs. "big gas" case



1 Both cases include 1.5GW imported hydro, not shown here.
2 Capital expenditure of 31,481 rand/kW for coal, 70,891 rand/kW for nuclear, 5,706 rand/kW for open cycle gas turbine, 8,659 rand/kW for combined cycle gas turbine, 19,477 rand/kW for wind, 35,596 rand/kW for solar photovoltaic.
3 Levelised cost of electricity, based on IRP figures, inflated to 2015, and higher coal power fuel costs of 415 rand/MWh (vs. 222 rand/MWh in the IRP). Assumes gas price of $10/MMBtu. Comparison does not include carbon tax.
NOTE: Numbers may not sum due to rounding.

SOURCE: Department of Energy Integrated Resource Plan; McKinsey Global Institute analysis

Two other capital estimates should also be highlighted. For pipelines, we assume a capital cost of 748,544 rand ($65,000) per inch-kilometre.[21] For the LNG regasification terminal, we estimate a total cost based on recent terminals of similar size, with a final value of 4.4 billion rand ($382 million) for a terminal with 170 billion cubic feet per year capacity.[22]

[20] *Integrated resource plan for electricity (IRP) 2010–2030: Update report*, Republic of South Africa Department of Energy, 2013.
[21] *Harnessing African natural gas: A new opportunity for Africa's energy agenda*, World Bank, 2014.
[22] Enerdata.

Estimating gas demand

The estimate of gas demand from the power sector is based on our forecast of installed gas power in 2030 (23 gigawatts), multiplied by an average utilisation rate. The utilisation rate is similar to an availability factor, but it reflects actual utilisation rather than potential utilisation. We assume an 80 percent utilisation rate for combined cycle gas turbine (CCGT) plants (this is equivalent to the non-renewables availability factor, because CCGT will be used as base load), and 10 percent for open cycle gas turbine (OCGT) plants (these should be used only to meet fluctuations in peak demand and so should have much lower utilisation rates). Finally, we assume power plant efficiency of 50 percent for CCGT plants and 40 percent for OCGT plants.[23] This generates total gas demand from the power sector of 1.04 trillion cubic feet per year.

We use two approaches to forecast industry demand. In the first approach, we consider the proportion of gas used in industry in three emerging-market countries with similar levels of gas demand (~1 trillion cubic feet per year), where gas use is not dominated by heating uses. The countries are India (29 percent), Argentina (31 percent), and Malaysia (38 percent).[24] We assume that South Africa's industrial demand could reach 30 percent. The logic here is that industry demand would follow a similar trajectory to that in peer countries once gas is available in significant quantities, and that gas prices reach a level that is affordable to industry. Finally, we calculate a figure for industry demand, assuming that the remaining 70 percent reflects 1.04 trillion cubic feet from the power sector. This generates an industrial demand figure of 447 billion cubic feet per year.

In the second approach, we consider the value-in-use method taken by the South African Department of Trade and Industry.[25] This methodology determines the volume of gas that existing and new industries would demand at different price points, based on the value they get from using gas (for heat or feedstock). At a gas price of $6 per million British thermal units, this approach estimates total industrial demand of 184 billion cubic feet. At a price of $4 per million British thermal units, the approach estimates gas demand of 886 billion cubic feet.

Given the uncertainty surrounding future gas prices, we assume a final range of zero to 450 billion cubic feet (where the comparative approach is the high end of the range).

Total gas demand (power and industry) thus ranges from 1.04 trillion cubic feet to 1.5 trillion cubic feet.

Estimating GDP and jobs impact

We calculate GDP and jobs in both 2020 and 2030, where 2020 is representative of the short term and 2030 of the long term. The role of gas in filling the power gap is a medium-term initiative, so the 2030 numbers are important.

In 2020, GDP is impacted by capital expenditure and new power produced. The two capital expenditure items are pipelines and power plant construction. For pipelines, we use an iron and steel multiplier (1.11) to determine GDP impact. The multiplier measures direct, indirect, and induced GDP impact. For power plant construction, we first estimate the localised component of power plant construction (44 percent for CCGT, 30 percent for solar photovoltaic) and then use a construction multiplier (1.16) to determine GDP impact.[26] For the new power component, we multiply power produced by an estimated price (0.89 rand, or $0.08, in real 2015 terms, a 21 percent increase over the current price) and then use

---

[23] *Study on the state of play of energy efficiency of heat and electricity production technologies*, JRC Scientific and Policy Reports, 2012.

[24] Enerdata.

[25] *Gas-based industrialisation*, Republic of South Africa Department of Trade and Industry, 2015.

[26] *Australian energy market operator: Cost of construction: New generation technology*, WorleyParsons, 2012.

a power production multiplier (1.21) to determine GDP impact. The estimated electricity price is calculated by comparing the levelised cost of energy in the "big gas" case to the current levelised cost of energy, and applying this increase factor to the current electricity price. This generates a total GDP impact in 2020 of 16 billion rand ($1.4 billion).

In 2030, GDP is impacted by new power produced and by gas-based industrial output. We follow the approach outlined above to determine power GDP impact, estimating a 2030 impact of 138 billion rand ($12 billion).

For the industry output, a series of assumptions is needed because the current use of gas in South Africa is extremely limited. In most cases, industries that could use gas are using low-cost coal. We allocate the 450 billion cubic feet of industry gas between cement, polyethylene, and methanol. These three industries span the range of potential of value added from gas; cement has the highest value added and methanol the lowest. We chose the industries to demonstrate this range rather than as a prediction of what the final use of the gas may be. Each has significant growth potential, through exports for polyethylene and methanol, and regional consumption for cement. In the manufacturing chapter, we show that demand for chemicals will grow substantially, further supporting the opportunity for growth in gas feedstock, while in the infrastructure chapter we reinforce the assumption of continued growth in demand for cement.

To determine the division between these three products, we assume that the entire ethane component of the supplied gas is extracted for production of polyethylene (an aggressive but simplifying assumption). We rely on data from wells in Marcellus and Barnett in the US (which are most similar to the Karoo Basin) to determine an ethane share of 9 percent of total volume.[27] Then we divide the remaining share (after fully meeting power sector demand) between methanol and cement based on the split of estimated production in these sectors in 2025.[28] Next, we calculate average value added for each of these sectors and determine the likely revenue based on gas consumed. Finally, we apply a chemicals industry multiplier (1.02) to determine GDP impact. This generates industry GDP impact of 114 billion rand ($10 billion). However, given the uncertainty in gas prices, we assume that the range could be anywhere from zero to 114 billion rand ($10 billion).

Adding 2030 power and industrial GDP together, we estimate a total impact of 138 billion to 251 billion rand ($12 billion to $21.8 billion). These power and industrial output value added estimates already include the value added of the extraction of the gas because the estimates do not subtract the cost of gas inputs to power and industrial use. Therefore, if shale gas is proven and its extraction is realised, its GDP impact is already embedded in this estimate. These GDP estimates therefore use domestic gas production as a basis, rather than gas imports.

In 2020, jobs are created in the construction of pipelines and power plants. For power plants, we again estimate the localised component of construction (44 percent for CCGT, 30 percent for solar photovoltaic), and then apply our jobs productivity multiplier, using construction for plants and manufacturing for pipelines. The total number of temporary jobs created by 2030 from all of these construction projects was estimated in a similar way. The estimate incorporates the full investment for new power plant construction and the full investment into pipelines, including the potential transmission and distribution pipelines from Mozambique to South Africa and, should shale be proven, from the Karoo to the rest of the country. This estimate came to 820,000 temporary jobs.

---

27 Keith A. Bullin and Peter E. Krouskop, "Compositional variety complicates processing plans for US shale gas", *Oil and Gas Journal*, volume 107, issue 10, March 9, 2009.

28 IHS Economics.

In 2030, we consider only permanent jobs. These are created in shale extraction and industry. We ignore jobs in the power sector, because we assume that all of these will be filled by employees from decommissioned plants. For the shale extraction jobs, we assume that shale production could range from 0.3 trillion to 0.7 trillion cubic feet. We then rely on Department of Trade and Industry analysis to determine jobs figures.[29] The department suggests 146,200 jobs for 1 trillion cubic feet per year extraction, and we scale this to the relevant range. For industry, we first calculate value added in industry by subtracting the input cost of gas from industry revenue. Then we apply a manufacturing productivity multiplier to determine jobs created.

[29] *Gas-based industrialisation*, Republic of South Africa Department of Trade and Industry, 2015.

5. SERVICE EXPORTS: RIDING THE WAVE OF AFRICA'S GROWTH

Analysing and expressing services trade can be complex. We need to first differentiate between the successful export of services (through the movement of skilled people between one country and another) and the foundation of a subsidiary in another country. While the latter may be a services company, it no longer represents an export of South African services; it represents foreign direct investment by a South African company. The subsequent flow of profits and dividends will still benefit South Africa as any investment might. However, the only measurable services provided might be the shared services provided from within South Africa. In this chapter we are investigating service trade opportunities rather than pan-African investment opportunities. We also investigate international service opportunities in business process outsourcing (BPO).

Services as a percentage of the economy

Services constituted 62 percent of South Africa's economy in 2013.[30] The individual sectors (from largest to smallest) include finance, real estate, and business services (578 billion rand [$50.2 billion]); general government services (451 billion rand [$39.1 billion]); wholesale, retail and motor trade, catering, and accommodation (406 billion rand [$35.2 billion]); transport, storage, and communication (247 billion rand [$21.4 billion]); and personal services (158 billion rand [$13.7 billion]). All prices are real 2010.

South Africa's market share of service exports to sub-Saharan Africa

Understanding South Africa's share of exports to sub-Saharan Africa required considerable analysis. We first removed government as well as tourism and travel services from the analyses to focus on services that South Africa specifically supplied to the region. This reduced South Africa's total service exports from 98 billion rand (2010 real prices) to 32 billion rand (2010 real prices), or $8.5 billion to $2.8 billion. Service trade data for emerging markets is incomplete in many cases, including from South Africa. To estimate South Africa's share of service imports by other African countries, it was necessary to mirror trade data from all the countries that do declare their service imports. These were predominantly the developed economies, and their service imports from South Africa came to 22 billion rand (2010 real prices), or $1.9 billion. Using this mirrored trade data, we eliminated all trade to these developed economies, and then assumed the remaining trade, 10 billion rand ($868 million), was to sub-Saharan Africa only. In reality, this number also included other emerging economies, so at best it is an overestimate. South Africa therefore has at most a 2 percent market share of service imports into the rest of sub-Saharan Africa.

GDP impact of construction

Using McKinsey's proprietary ISS database, we estimate the full value of construction projects in South Africa as 293 billion rand ($25.4 billion) in 2013 (2010 prices) and that contracts worth 318 billion rand ($27.6 billion) will be executed in 2015 (2010 prices). These projects include mining, oil and gas, process industries, real estate, social infrastructure, transport, and utilities. Since all of these prices are in 2012 real prices, we converted them to 2010 real prices.

Then we estimate the scale of midsize construction projects across sub-Saharan Africa. These could be worth between 211 billion and 261 billion rand ($18.3 billion and $22.6 billion) in 2015, reaching 438 billion to 594 billion rand ($38 billion to $51.6 billion) in 2030. These estimates were generated in three ways. Firstly, the UN Service Trade database indicates that construction service imports into sub-Saharan Africa (excluding South Africa) were 55.5 billion rand ($4.8 billion) in 2012. We estimate that 31 percent of the project contract

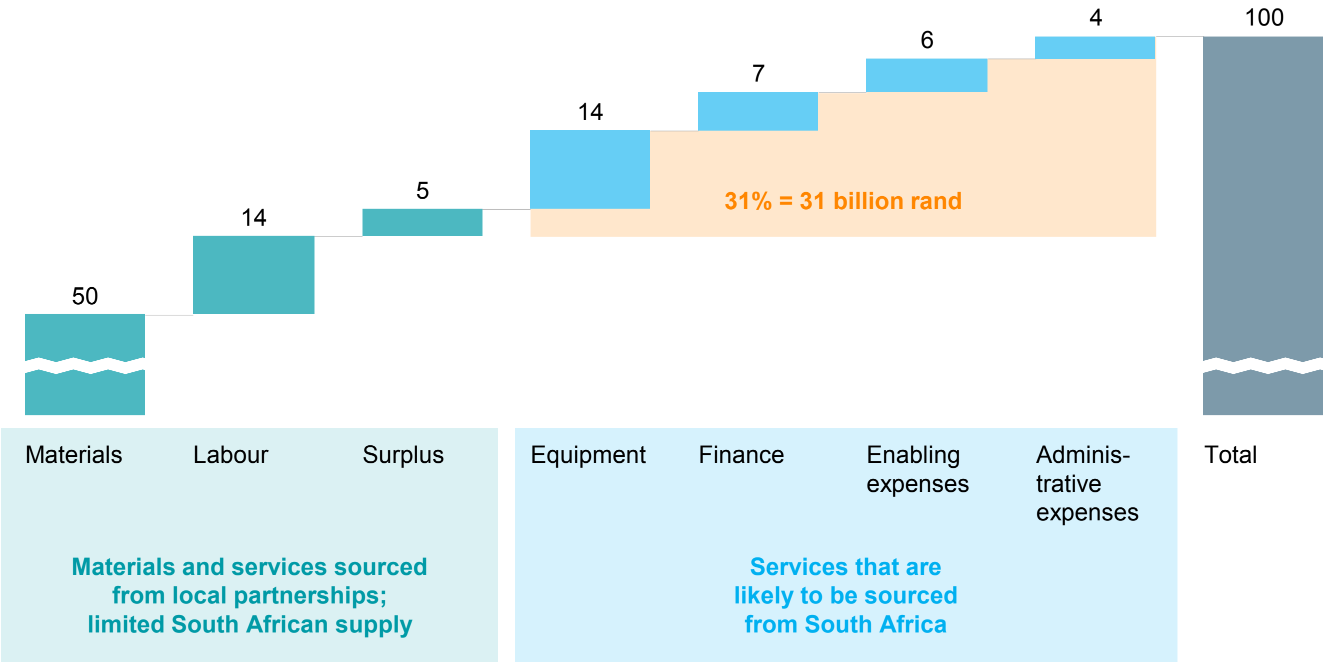
30 Labour force survey 2000–2007, Statistics South Africa; Quarterly Labour Force Survey 2008–2014, Quarter 4, 2014, Statistics South Africa; annual GDP data 1993–2013, Statistics South Africa.

value can be earned through service imports (Exhibit A7), which means the total value of these contracts was 179 billion rand in 2012 or 211 billion rand in 2015 ($15.5 billion or $18.3 billion) when escalated at 5.6 percent per year (the estimated 2015–20 GDP growth rate for sub-Saharan Africa).[31] This was extrapolated to 438 billion rand ($38 billion) in 2030 at a 5.6 percent per year rate until 2020 and a 4.7 percent growth rate per year from 2020 to 2030.[32] Secondly, we utilised data from the McKinsey proprietary IPAT 3.0 database. This database distributes a project's total spend over the years it is estimated to be implemented by; it extends to 2020. We used only data for projects between $200 million and $1 billion from this database, coming to an estimate of an average spend per year of 251 billion rand ($21.8 billion) from 2015 to 2017 in potential construction projects. This estimate was also extrapolated at a 5.6 percent per year rate until 2020 and a 4.7 percent growth rate per year from 2020 to 2030, to arrive at an estimate of 468 billion rand ($40.6 billion) in 2030. Thirdly, we used the McKinsey proprietary ISS database estimate of 261 billion rand ($18.8 billion) in projects in 2015. The ISS database has its own projections of projects until 2030, coming to 594 billion rand ($51.6 billion) in 2030. These three estimates were averaged, to get 500 billion rand ($43.4 billion) in potential construction projects in 2030 in sub-Saharan Africa (excluding South Africa).

Exhibit A7

Construction services revenue opportunities for South African companies lie primarily in equipment rental, finance, and project administration

Estimated typical spend breakdown of potential construction contracts, distributed between South African service providers and local partners[1]
Billion rand, 2010 prices



1 This breakdown estimates the typical components of project expenditure, based on scenarios measured in India (averaged for a number of different types of construction projects, including buildings, roads, railway, and power).
NOTE: Numbers may not sum due to rounding.

SOURCE: Government of India National Development Council; McKinsey Global Institute analysis

31 "Construction", in *Tenth five year plan: 2002–07, volume II: Sectoral policies and programmes*, Chapter 7.7, Government of India National Development Council, December 2002; *Sub-Saharan African real GDP projections 2015–2030*, IHS Global Insight World Market Monitor database.

32 Ibid.

The GDP impact was estimated by assuming South Africa could capture 20 percent market share of these projects and that 31 percent of this would be earned by South African firms (the other 69 percent going to local partners, local labour, and local manufacturers of cement and other materials). This revenue was then converted to a GDP impact using a business services multiplier from the input-output table for the South African economy (1.38). A construction multiplier was not used because the services provided are engineering, design, project management, and other services that are higher in value and closer to business services than other construction activities.

GDP impact of financial services

We estimated the size of the opportunity in banking revenues and insurance premiums by using proprietary McKinsey databases, McKinsey's Panorama Global Banking Pools and McKinsey's Panorama Global Insurance Pools.[33] These pools contain forecasts of revenue growth in each banking segment until 2020 in nominal US dollar values, as well as forecasts of premium growth for life and non-life insurance products in nominal US dollar values across the whole of sub-Saharan Africa until 2020. For banking we extended these forecasts to 2030, given the established nature of the industry and projections of significant GDP growth rates for the region. For insurance, we halved this forecast (in its nominal US dollar basis) from 2020 to 2030 because of the much higher uncertainty about how the industry will develop. We separated South African data from these forecasts and treated South Africa separately. All the analyses were conducted in nominal prices in dollars and then converted to South African rand using the forecast exchange rate for that year. The forecast exchange rate is projected to weaken to 18.89 rand per dollar in 2030, and this change in value is included to ensure that the estimates are all in nominal prices.[34] (We should note that this discussion in nominal rand-dollar exchange rates differs from that used for other sectors covered in this report, where all analyses are reported in real 2010 prices. All GDP and job creation impact analyses in this report were conducted in real 2010 prices, including this section.)

In the banking analysis, all growth estimations were performed on a dollar basis and then converted to rand using a forecast exchange rate for that year. Retail banking revenues for South Africa were estimated as 134 billion rand ($12 billion), and 188 billion rand ($17 billion) for the rest of Africa, in 2014. Retail revenue growth was calculated based on a growth rate in South Africa of 8.6 percent (nominal rand) from 2015 until 2030, while for the rest of sub-Saharan Africa the growth rate used for the same time period was 16.7 percent (nominal rand). Market share was assumed to reach 20 percent by 2030. For wholesale banking, we followed the same approach: revenues for South Africa were estimated as 108 billion rand ($10 billion), and 206 billion rand ($19 billion) for the rest of Africa, in 2014. The growth rate used for projections for the South African market was 11.1 percent (nominal rand) and for the rest of sub-Saharan Africa was 13.8 percent (nominal rand). Market share was assumed to reach 20 percent by 2030.

In the insurance premiums analysis, our database estimate of total insurance premiums in South Africa (life, health, and non-life) was $67 billion, while for the rest of sub-Saharan Africa it was $8 billion in 2014. We used a forecast 19.6 percent (nominal rand) growth rate per year from 2015 to 2020, and 11.4 percent (nominal rand) from 2020 to 2030. The South African market was forecast to grow by 8.4 percent (nominal rand) until 2030. We assumed South African companies' market share was 10 percent of the rest of sub-Saharan Africa in 2014 and would grow to 20 percent by 2030. We halved the sub-Saharan African growth rate from 2020 to 2030 because while the banking industry in sub-Saharan Africa is strongly developed, the insurance industry outside of South Africa is much less developed. Market fragmentation, emerging regulatory developments, and other variables make it more

[33] The banking pools database captures revenues reported in individual bank financial statements.

[34] IHS World Industry Service, February 2015.

challenging to accurately estimate the value of the sector. While the scale of the ramp-up is open to discussion, low penetration rates make it clear that this opportunity can grow to a significant scale.

We estimated that South African banks have a 12 percent share of sub-Saharan African banking revenues (wholesale and retail combined). We calculated this using the already-mentioned total estimated banking revenue pools for sub-Saharan Africa in 2014, and information from financial statements of the largest South African banks about their revenues earned outside South Africa. These banks included Standard Bank, FirstRand, Barclays Africa, and Nedbank. Included in the Nedbank foreign revenues is its 20 percent share of Ecobank's revenues, based on Nedbank's stake in that pan-African bank.

We used the same financial statement information from these banks, in addition to searching the financial statements of other banks active in sub-Saharan Africa, to estimate their revenues earned in sub-Saharan African as well as the split of these revenues between their home country and other countries in this region (Exhibit A8). For the international banks active in this region, we had to make some assumptions given that few report revenues from the region specifically. They often lump the data under Middle Eastern and African operations or under Europe, Middle Eastern, and African operations (EMEA). Standard Chartered and Société Générale declare their African revenues as well as their EMEA revenues, and from this we found that their total African revenues were 10 percent and 5 percent, respectively. We averaged this range to estimate that 7.5 percent of EMEA revenues were then for sub-Saharan Africa (a simplification through not including a component for North Africa), and applied it to all other international banks operating in the region. This estimate is likely accurate to within $1 billion, or within about 15 percent. From this analysis, we estimate that South African banks earn 17 percent of their revenues from the rest of Africa, again counting Nedbank's 20 percent share of Ecobank within this share. This share drops to 15 percent if the Ecobank share is removed. Standard Bank is an outlier among this group, earning 29 percent of its revenues from the rest of sub-Saharan Africa.

We based GDP impact on shared services offered to the combined wholesale and retail banking, and insurance companies. We also calculated the GDP impact of South Africa's being the investment banking hub of the region. Public sources estimate that shared service centres (headquarters and business functions, human resources, IT, procurement, and finance) constitute 2.7 (median) to 5.0 percent (worst quartile) of cost as a percentage of revenue.[35] These "costs" were considered as revenues that would be paid to South African head offices and their shared services departments, and hence used as the basis for the GDP analysis. These revenues were converted to value added for the sector using a multiplier of 1.26 from the input-output table for financial services.

For the impact of investment banking on the economy, we assumed that all services in this regard would be offered out of South Africa to customers across sub-Saharan Africa. That means all the revenues would be counted as contributing to South Africa's GDP. In the long run, some of the activities discussed here would be relocated to particularly large markets, like Nigeria and Kenya, but by 2030 South Africa could still be considered the hub. Investment banking included both typical investment banking activities and structured financing (onshore only). We included structured financing because unlike other corporate banking activities, it would also likely be offered out of South Africa. The bank would book its revenues in South Africa because it might not have a local licence or because the deal is in hard currency (the banks would be likely to have their hard currency balance sheets in South Africa, although this is not always the case). Our estimate is that investment banking in the rest of sub-Saharan Africa came to $150 million in 2014, and onshore structured financing came to $500 million. We treated the growth in these revenues exactly the way we

---

35 "Better, cheaper, faster", PriceWaterhouseCoopers Shared Service Center, no date.

treated wholesale banking, with one exception. Instead of assuming a 20 percent market share, we assumed a 30 percent market share for these services within sub-Saharan Africa by 2030. This is fairly ambitious. However, the difference between this opportunity and others discussed under wholesale banking is that if South Africa succeeds in becoming a financial hub, then this concept does not purely include South African banks: it includes all international banks basing their sub-Saharan African activities in South Africa, consequently raising South Africa's GDP with their activities in the country.

Exhibit A8

With the exception of Ecobank, South African banks are more active outside their home country than their African counterparts

Bank revenues earned across sub-Saharan Africa[1]
$ billion, 2014; total estimated at $59 billion

		Share of revenue earned outside home country %	**Market share of sub-Saharan African revenues** %
South African banks	27	17	45
Domestic banks	12	0	21
International banks	8	100	14
Nigerian banks	8	13	14
Pan-African banks	2	98	3
Kenyan banks	2	11	3

1 South African banks: Barclays Africa, Capitec, First Rand, Investec, Nedbank, Standard Bank; Nigerian banks: Access Bank, First Bank Nigeria, Guaranty Trust Bank, United Bank for Africa, Zenith Bank; international banks: Bank of America, Bank of China, Bank of New York Mellon, BNP Paribas, Citi, Credit Suisse, Deutsche Bank, Goldman Sachs, HSBC, JPMorgan Chase, Morgan Stanley, Société Générale, Standard Chartered, UBS; Kenyan banks: Co-operative Bank of Kenya, Equity Bank, Kenya Commercial Bank. The only pan-African bank is Ecobank, which is headquartered in Togo but operates largely in Nigeria. Twenty percent of Ecobank's revenue was attributed to Nedbank to reflect their investment structure.

SOURCE: McKinsey Panorama Global Banking Pools database; Thomson Reuters; annual reports; McKinsey Global Institute analysis

GDP impact of BPO

We used the global market, estimated at $156 billion in 2014, to determine the GDP impact of business process outsourcing.[36] We grew this opportunity using global growth rates of industries that principally use business outsourcing with IHS Global Insight forecasts. These industries included business, banking and related financial, communications, insurance and pensions, computer programming and related, financial market administration, and research and development services. Based on this assumed industry growth, we then estimated what share South Africa could capture. We estimate that South Africa should strive to reach the same global market share level as Russia, 4 percent.[37] Russia was chosen as an aspiration because it has costs and skills scores similar to South Africa's in international surveys, despite its disadvantages in language. Comparison to countries such

[36] Gartner, *Market share analysis: Business process outsourcing, worldwide, 2014,* April 28, 2015.

[37] Leslie Willcocks, Andrew Craig, and Mary Lacity, *Becoming strategic—South Africa's BPO service advantage, report 1,* LSE Outsourcing Unit, November 2012.

as the Philippines and India are less appropriate, because their skills and cost bases are different from South Africa's.

The total market potential in 2030 was estimated by using forecasts of growth in the industries that use BPO services. For instance, the global potential of communications services is expected to grow by 4.4 percent from 2015 to 2030, so BPO services for that sector were escalated at the same rate.[38] This breakdown was applied to several industries and then added to get an average growth rate for the BPO industry globally. To this, South Africa's current market share of 1 percent and aspirational market share of 4 percent were applied to estimate the potential revenue.[39] We used a range of multipliers from the input-output table for the South African economy (1.16 for communications, 1.26 for insurance and financial services, and 1.38 for other business activities).

GDP impact of other business services

The other business services provided to sub-Saharan Africa were not investigated in detail, but at a higher level. These services include merchant or trade-related activities, operations leasing, miscellaneous business, and professional or technical services such as legal, mining, and on-site processing services. To estimate the potential for exporting business services to sub-Saharan Africa, we assessed how South Africa's 2 percent market share compared to that of other countries. We took Brazil as a benchmark, estimating that it exports up to 26 percent of the services imported by Latin American countries and accounts for 38 percent of the region's overall GDP. We adjusted this for South Africa's portion of sub-Saharan Africa's GDP (25 percent) and arrived at a weighted benchmark figure of 17 percent. So if South Africa were to be as successful as Brazil in relative GDP terms, it should capture 17 percent of the imported services in the sub-Saharan African market. In addition, we estimated the 2030 demand for imported business services from this region by extrapolating the annual growth in imports from 2009 to 2012, which was 6.3 percent, to 2030.

Based on these calculations, we estimated that business service imports could increase from 132 billion rand ($11.5 billion) in 2012 to 392 billion rand ($34 billion) in 2030 (2010 real prices). We then calculated the portion that South Africa would have captured at its current market share (2 percent of 392 billion rand [$34 billion]) vs. the portion South Africa could capture if it were to match the benchmark (17 percent of 392 billion rand [$34 billion]), and found that South Africa could increase its exports of business services to the region by 58 billion rand ($5 billion). These export revenues were converted to value added for the sector of 79 billion rand ($6.9 billion) using a multiplier from the input-output table for business activities of 1.38.

GDP impact of shipping

We also estimated the potential for two shipping opportunities: transshipment and short sea shipping. First we estimated demand potential, then we tested this against port capacity.

For transshipment, we estimated container flows to West Africa and eastern South America from Asia by looking at total container traffic in these regions and adjusting this by the proportion of overall manufactured goods shipped between these countries and Asia (accounting for both imports and exports). We then assumed that South Africa could transship 20 percent of this traffic as a conservative estimate, based on global transshipment figures. In 2013, 28 percent of all port handling was for transshipment. In 2013, the proportion of all port traffic was 53 percent in Asia, 22 percent in Europe, and 11 percent in the Middle East/South Asia.[40] The potential revenues from this were calculated

---

[38] *New total sales in gross output, real forecasts*, IHS Economics, 2015.

[39] Ibid.

[40] Drewry Maritime Research.

by multiplying captured container traffic by a published transshipment port handling fee for South African ports. Growth in traffic to 2030 was calculated using IHS Global Insight forecasts of imports and exports to and from this region.

Potential revenue for short sea shipping was based on trade to and between West, East, and Southern Africa. Estimated traffic that South Africa could ship (assuming it has a fleet with advantage in Southern Africa) was calculated as capturing about 50 percent of intraregional trade and half of the global trade transshipped via South Africa (20 percent, as above). The weighted average was approximately 14 percent of traffic (container volumes) between these countries. Using an estimate of cost to transport of 4.93 rand ($0.43) per container per nautical mile, based on figures published by the Namibian High Commission, we then calculated the transport component of this traffic. Again, these figures were grown to 2030 using IHS Global Insight trade forecasts.

Finally, we estimated what the port capacity in South Africa could handle. South Africa has localised excess port capacity at its Ngqura deep-water port. While total demand could grow as high as five million to six million TEUs by 2030, the port has a design capacity of 2.8 million TEUs and currently handles 0.7 million TEUs, meaning it has capacity to handle 2.1 million TEUs. This could be worth 10 billion rand ($868 million) in value added.

6. AGRICULTURE: UNLOCKING THE FULL VALUE CHAIN

Calculation of impact on GDP

To calculate the potential impact on GDP of agriculture and agro-processing, we estimated the market demand growth by region of existing markets that South Africa exported to and estimated how much South Africa could capture of this growth, based on its historical performance in those markets. We undertook this analysis for raw and processing products together.

Initially, we calculated total forecast of demand for food, beverages, and tobacco products using regionally appropriate growth rates provided by IHS Economics in a forecast model we developed. We then calculated South Africa's 2012 market share of imports into all countries globally. We used figures for total imports and for South African imports reported by individual countries rather than reported export figures from South Africa, which do not always match import figures reported by the partner. The global demand growth was estimated for 24 categories of products until 2030, across seven geographical regions: sub-Saharan Africa, the Southern African Development Community (excluding South Africa), North Africa and the Middle East, Asia-Pacific, Europe, Latin America, and North America.

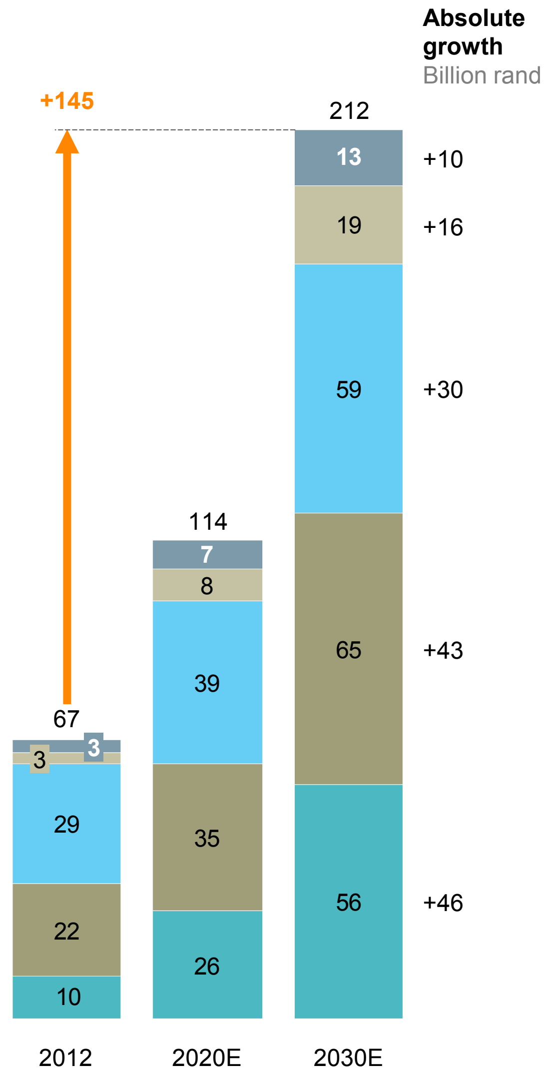
We then estimated the potential organic growth into each region based purely on South Africa's existing market share into those regions. We also estimated new regional market growth by setting a benchmark market share for each region, based on the highest decile of South Africa's market share of countries in that region, excluding the top countries in order to eliminate outlier shares. The rationale used was that if South Africa is able to successfully penetrate a product market in a region, it should be able to eventually penetrate other markets in that region to the same extent, because of similar competition, transportation costs, regional trade agreements, culture, and needs for food. (Differences between the trade environments in these regions exist but were impractical to adjust for.) Based on this, we were able to estimate what South Africa could be exporting in total to each region if the country could achieve benchmark market shares of imported products into those countries. This was then the basis for the increase in exports by product and, in total, the requisite growth rates.

We calculated the overall potential for South Africa by adding the organic growth and the new regional market shares in 2020 and 2030. Because it's unlikely that South Africa would reach the new market shares immediately, we incorporated a ten-year ramp-up period. We used World Bank World Integrated Trade Solution data for export levels and market-share calculations. The IHS Economics database provided regional growth rates for each category of manufactured product, while the IHS World Industry Service database provided GDP deflators and currency exchange rates. All analyses were undertaken using level two categories. For example, fruits, vegetables, and nuts were divided into edible vegetables, certain roots and tubers; edible fruit, nuts, peel of citrus fruit or melons; and preparations of vegetables, fruit, nuts, or other parts of plants. This then established the top-down estimate of the maximum potential should South Africa continue with success in its food exports, thereby increasing its exports from 67 billion rand ($5.8 billion) in 2012 to 212 billion rand ($18.4 billion) in 2030 (Exhibit A9). We excluded Latin America and North America. Latin America has a low projected growth rate and a low export base at present, while interviews confirmed that sheer distance means North America is not a very promising market.

Exhibit A9

South African agricultural exports could reach 210 billion rand by 2030

Estimated export potential of agro-processing and agricultural products[1]
Billion rand, 2010 prices



South African share of imports
%

	2012	2020E	2030E
North Africa and Middle East	0.5	0.8	1.2
Sub-Saharan Africa (excluding SADC)[2]	1.4	3.4	5.5
Europe	0.5	0.6	0.7
SADC (excluding South Africa)	38.8	47.1	60.6
Asia-Pacific	0.4	0.6	0.9

1 Based on products South Africa already exports; excludes Latin America and North America, which have lower export prospects.
2 Southern African Development Community.
NOTE: Numbers may not sum due to rounding.

SOURCE: IHS Economics; World Bank WITS; McKinsey Global Institute analysis

We split additional export value into the raw food and processed food components in order to separately estimate the GDP impact of each. The 24 categories of products were classified into raw and processed food categories, and we found that South Africa would shift from exporting 46 percent raw food and 54 percent processed food in 2012 to 29 percent raw food and 71 percent processed food in 2030. Based on this shift, we estimated that processed food would contribute 75 percent of revenue growth and raw food only 25 percent.

Based on this, we split the GDP impact between processing and production and used multipliers from the input-output table (1.11 for agriculture and 1.13 for processing).

The impact on job creation was estimated in several parts. The methodology discussed earlier in the appendix was applied in all cases. Agro-processing jobs were estimated from the additional export revenues generated and the methodology described. The agriculture jobs were more complex. Because the long-run trend is for mechanisation and decreased use of labour in commercial agriculture, purely increasing the output from agricultural production would not create many additional jobs. Therefore we based the job creation estimate on two main levers. First we discuss increasing the quantity of land used for agriculture. That would create jobs because the land is currently unused (commercial farmer growth). Second, we considered making subsistence-focused smallholder farmers more productive through increased land yields and switching to high-value crops, and we concluded that this would raise these farmers' incomes. But this would also increase the daily work required of them, and so they would evolve into small-scale commercial farmers and hire people to help them work their farms (smallholder growth). We estimated the revenue generation impact of these two approaches and estimated the job creation from this. We also split the value added of the increased agricultural production to GDP between these two approaches based on their relative revenue generation potential. Switching to higher-value crops (smallholder growth) is the higher income-generating option of the two, given the significantly higher value of the crops produced (from horticulture).

Confirming the growth estimate through productivity benchmarking

A detailed, bottom-up analysis was conducted to confirm whether the growth discussed would be achievable, and if so, for which products. The growth potential of individual categories of products was estimated as before but was now tested against the potential to increase agricultural production in that category. All farmers in the world can increase their productivity to some extent as technology, seeds, irrigation, and other tools become available. But even with today's technology, farmers in South Africa can improve their yields.

For each category of products, a representative crop that constituted the largest tonnage per year in that category was chosen; for example, chicken was used as a proxy for animal products, and grapes were used for fruits and for beverages (Exhibit A10). Each of these crops or products was then benchmarked against the average of the top quartile of producers; 28 other countries with a similar climate were used.[41] The exception was for cereals, where the second quartile was used instead of the top quartile because South African maize production (the proxy used in this case) is carried out without irrigation (dryland production), unlike the process in the countries in the top quartile in similar climatic zones. The benchmark was then used to assess by how much the agricultural output of each category of product could be increased (by 2030), here creating the low case, in which the total growth in exports was most certain. The high case, while still achievable, would require significant additional changes in agricultural technology or would require South Africa to process farm products from neighbouring countries.

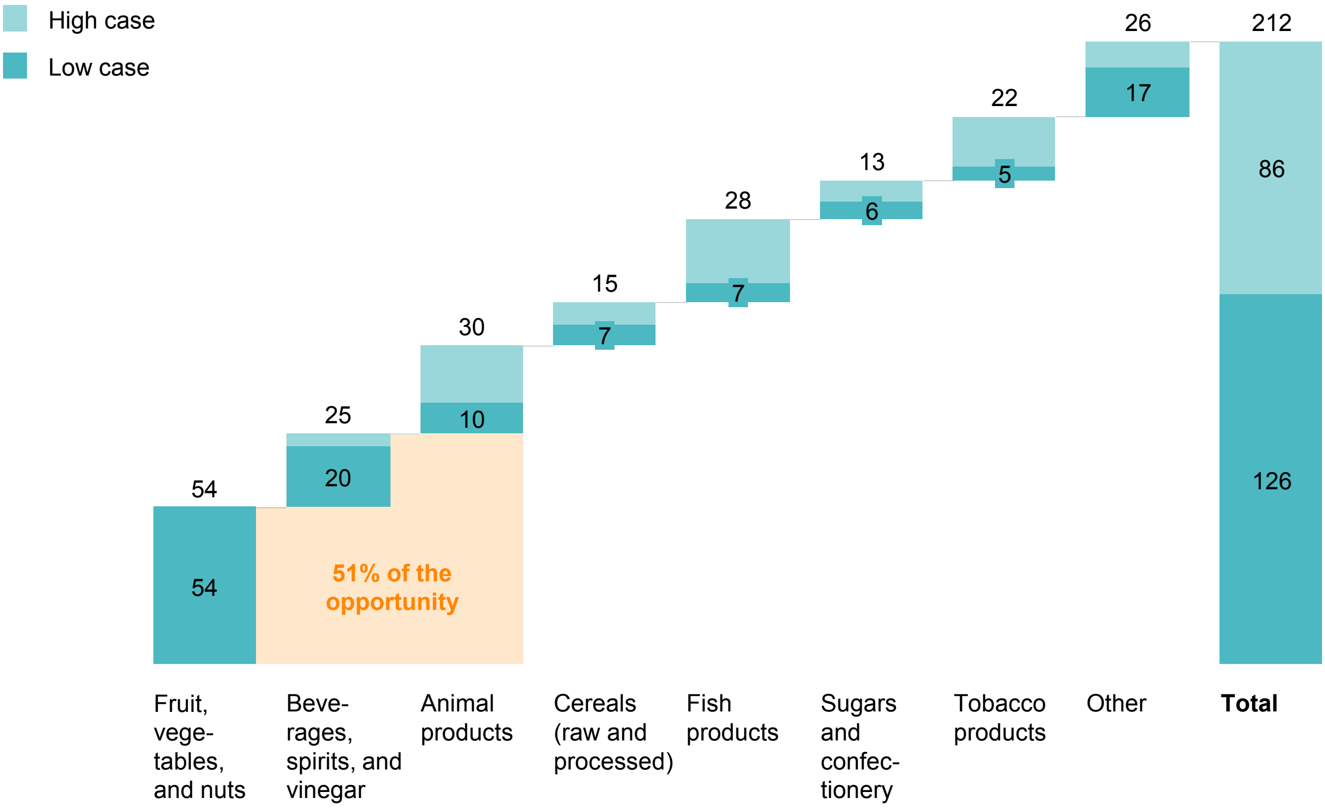
---

41 The total list of benchmarked agricultural products included maize, wheat, sugar cane, apples, grapes, oranges, tomatoes, strawberries, cow's milk, beef, and chicken.

Exhibit A10

South Africa's greatest agricultural opportunities lie in fruit, beverages, and animal products

Breakdown of total export demand potential by 2030
Billion rand, 2010 prices



	Fruit, vegetables, and nuts	Beverages, spirits, and vinegar	Animal products	Cereals (raw and processed)	Fish products	Sugars and confectionery	Tobacco products	Other	Total
Low case growth as proportion of 2012 exports %	79	125	72	126	50	105	85	102	**89**

NOTE: Numbers may not sum due to rounding.

SOURCE: IHS Economics; World Bank WITS; McKinsey Global Institute analysis

The range of improvement varies dramatically by crop type. South Africa is the top producer of oranges in the benchmark set and so had no potential for yield improvement. For grapes, even though South Africa fits just inside the top yield quartile, its yield still showed room for improvement at 14.8 metric tonnes per hectare, compared to an average for the top quartile of 25.8 metric tonnes per hectare. In other words, there is potential to increase yield by 74 percent. For fruit, vegetables, and nuts, exports were 30 billion rand ($2.6 billion) in 2012 and are projected to reach 54 billion rand ($4.7 billion) in 2030, requiring a 79 percent increase in output.

Cereals, with maize used as a proxy in this analysis, need to grow by more than 300 percent to meet potential 2030 demand. The yield improvement potential as benchmarked against the second quartile of top producers for maize is 92 to 126 percent. The top quartile of cereal producers—Israel, Jordan, Kuwait, and Qatar—produce maize almost exclusively under irrigation. Therefore applying this benchmark to dryland (non-irrigated crop cultivation) crops, in particular maize, is not helpful. We attempted to correct for this by instead using the second quartile of producers, including Australia and Argentina. South Africa does not inherently have the best conditions for producing these crops, and innovation would therefore be required to boost yield.

Fish products show large growth potential at 28 billion rand ($2.4 billion), but in 2012, South Africa exported only 4.5 billion rand ($101 million) in products, requiring an increase in production of almost 600 percent. Given the pressure globally for access to commercial fishing stocks and talk of depletion of this resource, it seems unlikely that South Africa could grow its output to this degree, so an increase of 50 percent was assumed in this case. However, this does not prevent South Africa from reaching this export potential. If the country can work with its neighbours to jointly bring their fish supply chains into local processing and production, South Africa can grow its output. South Africa's neighbours could benefit substantially from selling their catch into a South African processing chain and gaining access to the South African distribution chain. In addition, South Africa could pursue increased levels of aquaculture, specifically targeting seafood for the Asia-Pacific market, which is estimated to account for almost half the increased demand for fish products.

Estimate of land segmentation across farm types

To understand the potential impact for smallholders, we needed to confirm the share of land in the hands of different scales of farmers.[42] We used publicly available data on the number of households with access to agricultural land, as well as the total land cultivated (13 million hectares).[43] This data outlined the number of households and the size of farms they lived on. Weighting the allocation of land by the average farm size in each category and the number of households indicated that 90 percent of the land is used for commercial farms (20 hectares or larger), while 4 percent is used by smallholders (five to 20 hectares), and 6 percent is used by subsistence farmers (up to five hectares). This was verified by a research indicating that commercial agriculture covers 87 percent of farmland.[44]

---

42 Norma Tregurtha, Nick Vink, and Johann Kirsten, *Presidency fifteen year review project: Review of agricultural policies and support instruments in South Africa, 1994–2007*, Trade and Industrial Policy Strategies, March 2008. This research used information from the 2006 General Household Survey, conducted by Statistics South Africa. In 2006, 28,000 households participated in the survey.

43 J. L. Schoeman et al., *Development and application of a land capability classification system for South Africa*, National Department of Agriculture Forestry and Fisheries, Agricultural Research Council—Institute for Soil, Climate and Water, April 2002; *Evaluating the impact of coal mining on agriculture in the Delmas, Ogies and Leandra districts: A focus on maize production*, Bureau for Food and Agricultural Policy, May 2012.

44 Glwadys Aymone Gbetibouo and Claudia Ringler, *Mapping South African farming sector vulnerability to climate change and variability: A subnational assessment*, International Food Policy Research Institute discussion paper number 00885, August 2009.

Choosing high-value crops

We turned to a McKinsey team of experts and their proprietary analytical tool, the Agricultural Commodity Research Engine (ACRE), to identify seven high-value crops that would be suitable for our focus provinces, Eastern Cape, KwaZulu-Natal, and Limpopo, instead of grain crops. The team assessed a total of 19 crops among those put forward for consideration in the National Development Plan, and then applied three filters to choose the most suitable examples.

First the experts considered the agronomic and climatic characteristics that would drive crop suitability, looking at each province individually to understand specific climates. They then looked at efficiency of scale, concentrating on small-scale farmers, to understand which crops would be suitable for the sub-20-hectare land plots that we are focussing on. Different crops have minimum farm scales required for cost-effective production, based on several key factors, including mechanisation level, farm overhead, and downstream market volume requirements. Next, they looked at additional barriers to market based on on-the-ground knowledge and local experience. Finally, they identified seven high-value crops that ranged in suitability over the three provinces. Strawberries, other berries, and tomatoes were chosen as the three cops with the highest suitability for each of the climates.

The economic impact of these crops was assessed by estimating the revenue difference if maize production was shifted to these three products. The difference in yield and market price per ton for these three products and maize was sourced and analysed for the relative difference in the revenue value of the produce.[45] Only existing smallholder land was used, and only in the three provinces mentioned. We had already estimated that smallholders accounted for about 4 percent of total agricultural land use, and we estimated further (based on number of households) that roughly two-thirds of this land was in the three provinces we focused on. Based on publicly available data, we estimated that roughly 35 percent of this land, or 112,000 hectares, was dedicated to grain production.[46] We assumed that 80 percent of these farmers would be prepared to convert their land use by 2030, basing the scale of the high-value horticultural crop opportunity on the difference in value between the new crops and (the assumed current staple) maize. We estimate that the displaced grain crops would account for only 2 percent of the total land area currently used for maize and wheat, and therefore could not have a significant impact on current grain production.

Impact of improved inputs

The impact of improved inputs on agricultural yield was sourced from multiple references. Three levers were assessed. Fertiliser can typically increase yields by about 50 percent, seed varieties by about 15 percent, and access to improved training and information by about 40 percent.[47]

Preparation of the global cost competitiveness chart

Data is readily available on the volume and cost of traded agricultural products. We chose a number of representative countries in each major region we targeted for agricultural exports: Europe, Middle East and North Africa, sub-Saharan Africa, the Southern African Development Community, and Asia-Pacific. With limited room to assess individual products in each market, a number of representative products (maize, grapes, fish, raw animal products, poultry, processed sugar, and wine) and importing countries were chosen from the major opportunities identified. The import cost was assessed against all other importers

---

45 *Production data, South Africa 2013,* Food and Agriculture Organization of the United Nations, Statistics Division.

46 *Sector analysis agriculture prepared for submission to the Department of Higher Education,* Agricultural Sector Educational and Training Authority, June 2010.

47 Alice N. Mbatha, *Influence of organic fertilisers on the yield and quality of cabbage and carrots*, University of the Free State, November 2008; P. K. Agrawal, "Climate change and its impact on agriculture", presented at the Indian Seed Congress in Hyderabad, February 22–23, 2011; *Green Light: The African Cocoa Initiative—creating sustainable growth*, World Economic Forum, June 2014.

into that country for that product, on a dollar-per-ton basis.[48] From this we were able to construct cost curves in dollars per ton (2014 data), comparing the relative imported cost of South African produce against other countries for each product. We then benchmarked the quartile that South African produce fell into.

Identifying new parcels of land for commercial farming

McKinsey's ACRE tool analysis highlights potential untapped farming pockets across the Eastern Cape, KwaZulu-Natal, and Limpopo provinces. In this analysis, there are several areas of concentrated opportunity that may warrant a deeper exploration for focussed development. This includes areas such as the southwest corner of Limpopo, where over 300,000 hectares of high-potential land are not in use and may have the potential for high productivity if activated. However, this cluster of opportunity has a slightly greater prevalence of drought occurrence and may require more intensive focus on irrigation use. The Eastern Cape and KwaZulu-Natal clusters have moderate precipitation levels; however, irrigation requirements vary by crop and will need to be explored on an individual basis.[49]

48 International Trade Centre Trade Map database, July 2015.

49 Information on precipitation patterns from the Agricultural Research Council, www.arc.agric.za/Pages/Home.aspx

7. EQUIPPING SOUTH AFRICANS FOR THE JOBS OF THE FUTURE

Estimating the skills breakdown by each type of job created

This section of the report discusses how the jobs created by the big five growth opportunities will translate into required skills. To understand what skills are required by each sector, we used data from the Quarterly Labour Force Survey, Quarter 2, 2014.[50] This database breaks down employment in every sector by types of jobs. We then bucketed these job types into five broad categories based on required skill level. The categories are: elementary occupations, which require no specific skill set and can be filled by an individual with or without a school leaving ("matric", or secondary) qualification; skilled trade workers such as clerks, service and sales operatives, skilled labourers, crafts and trades workers, and plant and machine operators and assemblers (each requires specialised vocational training); technicians and associate professionals (which require a technical tertiary qualification and an apprenticeship period); professionals (all jobs in professional roles, which typically require a university degree); and managers (including senior officials in government and management positions in the private sector).

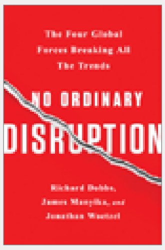
Based on this breakdown, we were able to work out the percentage distribution of these five skills types by sector. We also estimated the skills breakdown for the broader economy. We then applied these skills breakdowns to the jobs estimates for each of the five opportunities. For agriculture, we applied the manufacturing sector's skills profile to agro-processing and agriculture's skills profile to actual agricultural production. For gas, we applied the mining sector's skills breakdown to shale gas jobs and the manufacturing sector's skills breakdown to jobs resulting from gas-based industries, such as chemicals and concrete. For infrastructure, we used the construction sector's breakdown, and for manufacturing and services, we used their respective skills breakdown. Only the direct jobs created were treated in this manner; all the estimated jobs for the broader economy were assessed against the skills breakdown of the entire economy. This allowed us to confirm the skills distribution required by each of the big five opportunities and of all the opportunities together. We have not accounted for how skills may change over the next 15 years.

Estimating the impact of digital labour platforms

This analysis was borrowed from the McKinsey Global Institute report *A labour market that works: connecting talent with opportunity in the digital age*, June 2015.

50 Quarterly Labour Force Survey, Quarter 2, 2014, Statistics South Africa, July 29, 2014.

RELATED MGI AND MCKINSEY RESEARCH



No ordinary disruption: The four global forces breaking all the trends (May 2015)
This new book builds on 25 years of MGI research to explore a world that will be very different from the one we have grown up in, and what these forces mean for business leaders, individuals, and policy makers. The sheer volume of change could be overwhelming, but the opportunities are enormous.

Africa at work: Job creation and inclusive growth (August 2012)
Africa is the world's second-fastest-growing region, and around 90 million of its households have joined the world's consuming classes in the past decade. But African economies must create wage-paying jobs more quickly to sustain these successes and ensure that the benefits of growth are shared widely.

Nigeria's renewal: Delivering inclusive growth in Africa's largest economy (May 2014)
With the right reforms and investments, Africa's largest economy can live up to its economic potential and bring more Nigerians out of poverty.

Lions on the move: The progress and potential of African economies (June 2010)
Africa's economic growth is creating substantial new business opportunities that are often overlooked. Consumer-facing industries, agriculture, resources, and infrastructure together could generate as much as $2.6 trillion in revenue annually by 2020, or $1 trillion more than today.

Lions go digital: The Internet's transformative potential in Africa (November 2013)
A majority of urban Africans own Internet-capable devices and go online regularly. If infrastructure investment continues, the Internet will take hold on a much larger scale in the coming decade, potentially adding $300 billion a year to Africa's GDP.

McKinsey Insights app
Explore insights from across McKinsey, MGI, and *McKinsey Quarterly*—all delivered seamlessly to your mobile devices. Available for both Apple and Android devices.

www.mckinsey.com/mgi
E-book versions of selected MGI reports are available at MGI's website, Amazon's Kindle bookstore, and Apple's iBooks Store.
Download and listen to MGI podcasts on iTunes or at
www.mckinsey.com/mgi/publications/multimedia/

McKinsey Global Institute
August 2015

www.mckinsey.com/mgi

@McKinsey_MGI
McKinseyGlobalInstitute