Global Journals LaTeX JournalKaleidoscope™
Artificial Intelligence formulated this projection for compatibility purposes from the original article published at Global Journals. However, this technology is currently in beta. *Therefore, kindly ignore odd layouts, missed formulae, text, tables, or figures.*

Macroeconomic Impact Analysis of Kusile and Medupi Electricity Generation Investment: An Eye Bird View at Construction and Operational Phase

Joel Marumo Mosenogi[1] and Olebogeng David Daw[2]

[1] North West University

Received: 16 December 2018 Accepted: 1 January 2019 Published: 15 January 2019

Abstract

Economic growth, unemployment, and inequality have been challenges facing South Africa in the past decade. Amongst others, energy security is one of the underlying factors of declining foreign direct investment and economic growth. This study investigates the impact of electricity investment in Kusile and Medupi power plant on the macroeconomic environment of South Africa with the application of the Social Accounting Matrix Model (SAM). The study results show that the infrastructure investment in the two-power station has a positive impact in the South African Economy at the macroeconomic level. Furthermore, infrastructure investment shows to have a positive impact on GDP and does add significant value to Gross Fixed Capital Formation in the country at both construction and operational phase of Kusile and Medupi. Furthermore, household income is positively impacted by the economy as a result of electricity infrastructure investment. The SAM-based Model shows that total employment will be positively impacted and labor force with different skills level will unequally benefit.

Index terms— economic growth, macroeconomic, employment, electricity, infrastructure.

1 Introduction

or more than ten years, the South African economy has been under-performing, growing below 3% per annum while on the other hand unemployment, poverty, and inequality being unacceptably high. Such challenges saw the development and adoption of the National development plan and increased investment in electricity infrastructure. The National Development Plan (NDP), aims to half poverty, reduce inequality and unemployment by the year 2030. To achieve the NDP goals, sufficient energy is required to ensure reliable and continuous production, which could create more jobs, and it is against this backdrop that the country resolved to invest in electricity infrastructure.

Infrastructure development remains the backbone of every developing economy across the globe more, especially in Africa. As a developing country, South Africa, to a certain extent, is facing infrastructure challenges in various sectors and electricity is one of them. Energy infrastructure is key to both foreign and domestic investment. In 2008, South Africa experienced electricity blackouts costing the economy billions of rand and ultimately scaring off investors. Within infrastructure investment projects, South Africa has amongst others identified two energy projects that are expected to increase the country's generation capacity and improve on stable electricity supply. These projects are Kusile Power Plant and, Medupi Power Plant and According to Engineering News, Projects in Progress, (March 2015), the investment for these projects is estimated to the tune of R118.5 billion and R105 billion, respectively. At both the construction and operational phase, these projects are expected to stimulate economic growth and create jobs. Of critical importance in a developing economy like South Africa is the extent at which women are afforded equal opportunity as men to participate as developers and suppliers of labor in these projects.

The critical question today is, what is the impact of such an investment in the South African economy about the desired outcomes of the NDP in the context of returns on investment? To scientifically respond to this question, this study applies the Social Accounting Matrix to reliably assess the Kusile and Medupi investment on the macroeconomic conditions of South Africa, quantitatively analyzing the impact at both construction and operational phase.

2 II.

3 Background and Literature

South Africa is facing enormous challenges of low economic growth, high unemployment, high levels of poverty, and inequality. To achieve high economic growth and increased household income, South Africa needs to create a conducive environment for investment (both local private and Foreign Direct investment). One other way to achieve the development proper infrastructure, is through participation of the construction sector as the producer of infrastructure stock, which is enabled by public infrastructure investment. As argued by Mbanda and Chitiga (2013), increasing public infrastructure investment is expected to raise the marginal productivity of private factors of production, lower production costs, increase levels of employment and increase economic growth **??**Fedderke and Bogetic, 2006; Kularatne, Undated; Garlick, 2008 and **??**uild, 2000). Investment in infrastructure affects many variables in the economy which include productivity, labor demand, economic growth, prices, consumption, employment, income distribution, poverty, and welfare, (Mbanda and Chitiga, 2013). Noting the low growth and high unemployment in South Africa, investment in Kusile and Medupi are generally expected to stimulate growth and increase employment across the country in the short to long term.

As indicated in table 1 below, South Africa's GDP growth slowed from 1.3% in 2017 to an estimated 0.7% in 2018. The medium-term outlook is weaker than projected in the 2018 MTBPS. Economic growth is expected to reach 1.5% in 2019, rising to 2.1% by 2021. The revisions take into account weaker investment outcomes in 2018, a more fragile recovery in household income and slower export demand than expected due to moderating global growth. Consumer inflation has also been revised down due to lower oil prices and food inflation than previously assumed (South African National Treasury, 2019). As a percentage of GDP, investment has persistently declined, reaching a 13-year low of 17.7% in the third quarter of 2018. The combination of low growth in employment, investment, and productivity continue to restrain economic growth. According to South African National Treasury (2019), investment growth is projected to rise from 1.5% in 2019 to 3% in 2021 as confidence gradually increases, worn-out capital is replaced, and the state improves its ability to execute capital projects. However, concerns about electricity supply and slower global growth pose risks to the near-term outlook. The Investment Summit affirmed that South Africa remains an attractive investment destination, with R300 billion in investments pledged across a variety of sectors. Efforts by the President's investment envoys yielded another $28 billion in investment pledges, (South African National Treasury, 2019).

According to Statistics South Africa (2019),the first quarter of 2019 shows that unemployment increased by 0.5% point to 27.6% compared to the last quarter of 2018. This increase is caused by a decline of 237 000 of people in employment and an increase of 62 000 in the number of people who were unemployment between the fourth quarter of 2018 and the first quarter of 2019. According to Statistics South Africa (2019), the results indicate that South African labor force increased by 149 000 in the first quarter of 2019 compared to the last quarter of 2018.The decline of 237 000 in employment during the first quarter of 2019 was experienced in six sectors. However, the construction had the largest share of decline which amounted to 142 000, followed by Finance with 94 000, Community and social services decreased by 50 000, Private households with 31 000, Mining with 20 000 and Agriculture with 12 000. Employment gains were observed in Transport which increased by 59 000; Trade increased by 25 000, Utilities increased with 16 000 and Manufacturing increased with 14 000, (Statistics South Africa, 2019).

Many economists have presented evidence to prove the positive link or relationship between infrastructure development and economic growth in many countries. **??**schauer (1989) and Munnell (1990) found a strong positive relationship between infrastructure and growth. In their study, Fedderke & Garlick (2008), when observing infrastructure development and economic growth in South Africa, they concluded that based on both theoretical and empirical evidence there is an existence of a robust positive relationship between infrastructure and economic growth. They particularly pointed out the following findings:

? Aggregate infrastructure stock and investment drive economic output; ? The driving relationship between economic output and infrastructure varies significantly across different types of physical infrastructure; and ? Infrastructure impacts on output both directly and indirectly, via increased private sector investment, improved productivity, and rising exports.

In general, infrastructure reduces the cost of production and consumption and makes it easier for participants in the economy to enter into transactions. Thus, if the efficiency of infrastructure is increased, there should be a concomitant improvement in growth performance, service provision and development outcomes. Overall, this should also result in improved economic competitiveness, **??**DBSA, 2006). This indicates that infrastructure stock is also an input towards productivity and ultimately, improved economic output. This is further supported by Serven (2010), who argues that, Conceptually, infrastructure may affect aggregate output in two main ways: first, directly because infrastructure services enter production as an additional input, and second, because they

raise total factor productivity by reducing transaction and other costs thus allowing a more efficient use of conventional productive inputs.

4 III.

5 Methodology

The study applies South African Social Accounting Matrix to perform a macroeconomic impact analysis of Kusile and Medupi investment in the South African economy. As argued by Fathurrahman (2014), the SAM analysis is mainly an impact analysis usually used to describe the impact of a given policy on the economy. A SAM coupled with a conceptual framework that contains the behavioural and technical relationships among variables within and among sets of accounts can be used for the evaluation of the economy-wide effects of policy changes or other economic impacts rather than only for purely diagnostic purposes (van Wyk, Saayman, Roussouw and Saayman, 2014; Pyatt, 1988:349).

The model will therefore provide reliable quantitative assessment of the subject under study to effectively inform economic and infrastructure investment policy and strategy direction for South Africa. For such impact analysis to be effectively performed, the model specification therefore outlines all agents in the economy to reflect macroeconomic impacts.

The starting point in computing the multiplier effects is the input-output (IO) table or the social accounting matrix (SAM).

The first step is to choose the exogenous accounts. The rest of the world, the government, and the investment accounts will be included in the exogenous bloc of the multiplier model. If we want to compute only direct and indirect effects, the household account will also be included in the exogenous bloc. The next step in producing SAM multipliers is to calculate the direct requirements matrix (A). The values of the cells in the direct requirements matrix are derived by dividing each cell in a column by its column total. Each cell in a column of the direct requirements matrix A shows how many cents of each producing industry's goods or services are required to produce one dollar of the consuming industry's production.

Next in the process of producing the multipliers, the Leontief Inverse is calculated. A SAM model can be written as:X -AX = Y, (**1**)

where X is the column vector of gross industrial output, Y is the column vector of exogenous final demand accounts, and A is the direct requirement matrix.

We can express this equation as:(I -A)X = Y (2) or X = (I -A) -1 Y (3) X = BY, (**4**)

where I is the identity matrix (with "1" in the diagonal, "0" in all other fields), (I-A) -1 is the "Leontief Inverse (Matrix)" = B (or B' if induced effects are included), B (or B') is the matrix of direct and indirect (and induced) coefficients bij (or b'ij), and bij (or b'ij) = "Leontief Coefficient" representing the direct and indirect (and "induced") requirements per unit of final demand for the output of sector j.

Using the B (or B') matrix, we can compute the effects of an exogenous shock on the output, valuedadded, and employment in the different industries and on the household income. The output multiplier for an industry is the ratio of the direct and indirect (and induced when included) output changes to the direct output change due to a unit increase in final demand. Multiplying a change in final demand (direct impact) for an individual industry's output by that industry's output multiplier will generate an estimate of direct and indirect impacts (and induced when included) upon output throughout the economy, (International Finance Corporation, 2015).

We can also compute the value-added, income, and employment effects. The gross value-added (or GDP) effect is the direct and indirect (and induced when included) gross value-added changes to the direct output change, due to a unit increase in final demand. The income effects show the direct plus indirect (and induced when included) income change to the direct output change due to a unit increase in final demand. The employment effects show the direct plus indirect (and induced when included) employment change to the direct output change due to a unit increase in final demand. The employment effect in each industry is computed by multiplying the employment coefficient (number of employees per Rand of output) in that industry by the change in the output of the industry as a consequence of a shock to the final demand in industry, (International Finance Corporation, 2015).

6 a) Employment Effects (Coefficient)

SAM framework is using monetary values in its transactions matrix. However, as already discussed in the previous sub-section, employment changes will be analyzed for the study. To do that, the monetary value should be converted into employment value by using an employment coefficient. As argued by International Finance Corporation (2015), the employment effects will be estimated in the following steps.

1) Compute the employment coefficient for each industry. For example, for industry i: Employment coefficient i = number of employees in industry i / output of the industry I (measured in monetary units). 2) Compute the change (using the output multiplier) in the output of the industry i due to a shock to the final demand of an industry j.

3) Multiply the change in the output of an industry i by the employment coefficient of industry i. This will give the change in the number of jobs in industry i as a result of a shock in the final demand of an industry j.

4) Total number of new jobs in the economy as a result of a shock to the final demand of an industry j = ? i change in employment in industry i Thus, computing employment will be done as follows:

As Argued by Fathurrahman (2014), to do this, let's assume "e" as an employment coefficient which will be described as total human capital needed per billion IDR of sectoral output. Expressing in mathematical form, it can be written as follows: e j = Employment j /Y j (5) Where: Y j = Total output of sector in row j Employment j = Total employment for the sector in row-j e j = employment coefficient for the sector in row-j

Here, we assume those employment coefficients will remain constant regardless of changes in sectoral output. The employment impact (changes) then can be assessed by multiplying employment coefficient by each sector's output changes: ????? = ????????? (6) Where:

????? =Employment impact (changes) for sector in row-j (7) ????? = Output changes for the sector in row-j (8) The turnover of the business economy associated with the electricity infrastructure investment is an "outside agents" impacting on the model through an increase in its final demand components. The implication of this is that for every project a (column) vector for every relevant final demand component of the model, at macro level, had to be compiled.

7 IV.

8 Study Results

9 a) Macroeconomic Impacts Results

This section presents total macroeconomic results for both investment (construction) phase, operational phase, and combined results of both Kusile and Medupi power plants at an aggregate level.

10 i. Macroeconomic Impacts of the Construction (Investment) Phase

The impact of the construction Phase of the Medupi and Kusile power stations in 2018 prices is in the table below. As argued by Perkins (2011) economic infrastructure may be compared to the foundation of a building. It plays a supporting role, facilitating the multitude of productive economic activities that constitute the bulk of the economy, or gross domestic product. From the results in table 2below, economic growth, the GDP figures, i.e. direct, indirect and, induced arise from the implementation of these projects. The total GDP of R190.4 billion shows the additional economic growth value that will on average be generated on an annual basis for the next 5 -8 years during the construction phase in the South African Economy with direct economic impact being the highest at R79.959 billion.

The total value of capital accumulation on annual basis during the construction phase of Kusile and Medupi Power Station is estimated to R423.890 billion per annum with direct impact taking the largest share of R182.914 billion followed by induced impact at R167.802 billion and direct impact being the lowest at R73.173 billion. The construction of the two-power station, will as a result, add value to the South African gross fixed capital formation. From table 2 above, it is evident that during the construction phase, a total number of 1 067 269 job opportunities are created through-out South Africa as a result of the electricity infrastructure construction. The direct (450 271), indirect (216 356) and induced (400 642) impacts of employment form the total impact of employment. Of the total employment opportunities created during the construction phase, a significant impact is due to the direct impact followed by induced impact and the indirect impact.

The induced employment of 400 642 job opportunities refers to the number of jobs created where the salaries and wages from direct employment will be spent. The indirect employment of 216 356 job opportunities shows the number of jobs that will be created in other sectors because of their increased business activity resulting from supplying goods and services to the electricity infrastructure development projects. Because the power stations also require the expansion of coal activities, water supply as well as supply from other economic sectors, the multiplier effect (indirect and induced) effect are significant.

Amongst job opportunities emanating from the Medupi and Kusile Investment phase, semi-skilled (629 500) laborers are expected to be the most benefitting followed by un-skilled (222 370) and skilled at (215 399). However, noting that households are suppliers of labor to the market and in return received salaries and wages, results from the table above shows that various households in terms of low, medium and high income do received income. Worth noting is that, high income households receives the highest amount of income R81 417 billion, followed by medium income households at R23 939 billion and low-income households receiving the lowest income at R20 315 billion per annum.

ii.

11 Macroeconomic Impacts of the Operational Phase

The Operational Phase impact of the Medupi and Kusile power stations in 2018 prices is shown in the Table below. Similarly, in terms of economic growth, the GDP figures, i.e., direct, indirect, and induced arise from the implementation of the approved ECIC projects. The total GDP of R106.8 billion shows the additional economic

growth that will on average, be generated on an annual basis for the next 20 years during the operational phase in the South African Economy.

Investment in energy supply is largely expected to attract and stimulate foreign direct investment and local investment. According to Glennen (2017), foreign investment is commonplace within the energy sector. As indicated in table 3 below, capital formation is expected to continue growing post investment at an operational phase of Kusile and Medupi power station with a total impact of R376 467 billion per annum. Addition energy into the grid in South Africa has the potential to attract more investment and create more jobs as a result. In table 3 above, it is evident that during the operational phase, a total number of 480 939 job opportunities will

Volume XIX Issue IV Version I Year 2019 ( ) be created and sustained throughout in South Africa economy due to the Medupi and Kusile power stations. The direct (103 992), indirect (155 553), and induced (221 393) impacts of employment form the total impact of employment. Of the total employment opportunities created during the operational phase, a significant impact employment impact is realized at induced impact followed by the indirect impact. The induced employment of 221 393 job opportunities refers to the number of jobs created where the salaries and wages from the direct employment is being spent. Induced employment level remains high at operational phase as result of economic opportunities that will be created by a sufficient energy supply in the economy in other economic sectors not necessarily related to electricity industry in their nature of business. The indirect employment of 155 553 job opportunities will be the number of jobs that will be created in other sectors because of their increased activity resulting from supplying goods and services to Power Stations for continuous operation such as coal industry. Comparatively, total impact on household income across all households is expected to decline to R69.156 billion at operational phase compared to R125.672 billion during investment (construction) phase.

13 iii. The Overall/Combined macroeconomic Impacts

The Overall / Combined (construction and operational phases) impact of the Medupi and Kusile power stations in 2018 prices is shown in the Table 4below.The impact of the construction phase was averaged out over the operational period.

Table 4 below indicates that the Medupi and Kusile R223.5 billion (R118 billion +R105 billion) capital investment programme in its own right will:

14 Conclusion

According to Keynesian economic theory, any injection into the economy via investment capital, government spending or the like will result in a proportional increase in overall income (measured through GDP) at a national, provincial and local level, Eskom Holdings SOC Ltd., 2017).. The basic principle of this theory is that increased spending will have carrythrough or multiplier effects or impacts, which result in even greater aggregate spending over time. The multiplier itself is an attempt to measure the size of those carry-through effects or impacts. The multiplier takes all direct and indirect benefits from that investment or the change in demand into account. The size of the impact or the effect on the economy depends on the size of the multiplier in the economy **??**Eskom Holdings SOC Ltd., 2017).

Various types of analytical tools may be adopted to assess the impact of investment on employment. However, since investment is a component of the national aggregate demand, a 'Keynesian 'type of demand-driven (multiplier) approach may prove to be the most suitable choice for understanding such questions. The Social Accounting Matrix (SAM) is an accounting platform that offers such an approach (Alarcon, Ernst, Khondker, and Sharma, 2011). The findings of this study are largely based at two levels, which macroeconomic and industry level (microeconomics) both from a gender analysis.

This study thus present results on the impact of electricity infrastructure investment impact on macroeconomic conditions in the South African economy with specific reference to Kusile and Medupi power stations. The Social Accounting Matrix Model application results does show that the infrastructure investment in the two-power station has a positive impact in the South African Economy atthe macroeconomic level. At a macroeconomic level, infrastructure investment shows to have a positive impact on GDP and does add significant value to Gross Fixed Capital Formation in the country at both the construction and operational phase of Kusile and Medupi. Furthermore, household income will be positively impacted by the economy as a result of electricity infrastructure investment. The SAM-based Model shows that total employment will be positively impacted and labor force with different skills level will unequally benefit. Furthermore, Gross capital formation will be positively impacted. It is against these results that the study concludes that, investment in Kusile and Medupi power stations are good for the country due to their positive macroeconomic impact both at construction and operational phases. [1] [2]

[1] Macroeconomic Impact Analysis of Kusile and Medupi Electricity Generation Investment: An Eye Bird View at Construction and Operational Phase

[2]

1

Percentage Change		Actual		Estimates		Forecast	
	2015	2016	2017	2018	2019	2020	2021
Final Household Consumption	1.8	0.7	2.2	1.5	1.5	2.0	2.3
Final Government Consumption	-0.3	1.9	0.6	0.9	0.2	0.9	0.7
Gross Fixed-Capital Formation	3.4	-4.1	0.4	-0.2	1.5	2.1	3.0
Gross Domestic Expenditure	2.1	-0.9	1.8	1.2	1.3	1.9	2.2
Exports	2.8	1.0	-0.1	2.0	2.3	2.7	2.8
Imports	5.4	-3.8	1.6	3.8	1.7	3.2	3.3
Real GDP Growth	1.3	0.6	1.3	0.7	1.5	1.7	2.1
GDP Inflation	5.1	6.8	5.5	5.8	5.8	5.4	5.3
GDP at Current Prices (R billion)	4 051.4	4 350.3	4 651.9	4 957.9	5 323.1	5 708.1	6 135.9
CPI Inflation	4.6	6.3	5.3	4.7	5.2	5.4	5.4
Current Account Balance (% of GDP)	-4.6	-2.8	-2.4	-3.5	-3.4	-3.8	-4.0

Source: National Treasury

Figure 1: Table 1 :

2

	Investment Impact: National			
	Direct impact	Indirect impact	Induced impact	Total impact
Impact on Gross Domestic Product	R 79,959	R 36,854	R 73,556	R 190,369
Impact on capital formation	R 182,914	R 73,173	R 167,802	R 423,890
Total impact on employment [job opportunities]	450,271	216,356	400,642	1,067,269
Skilled impact on employment [job opportunities]	56,958	48,340	110,101	215,399
Semi-skilled impact on employment [job opportunities]	304,524	119,364	205,611	629,500
Unskilled impact on employment [job opportunities]	88,788	48,652	84,930	222,370
Impact on Households				R 125,672
Low Income Households				R 20,315
Medium Income Households				R 23,939
High Income Households				R 81,417
Fiscal Impact				R 55,389
National Government				R 51,363
Provincial Government				R 581.4
Local Government				R 3,444.1
Impact on the Balance of Payments				R -125,294

[Note: Source: Author's Computation Results based on SAM Model]

Figure 2: Table 2 :

3

	Operational Impact: National			
	Direct impact	Indirect impact	Induced impact	Total impact
Impact on Gross Domestic Product	R 40,198	R 26,029	R 40,557	R 106,784
Impact on capital formation	R 223,500	R 60,552	R 92,415	R 376,467
Total impact on employment [job opportunities]	103,992	155,553	221,393	480,939
Skilled impact on employment [job opportunities]	28,601	30,315	60,747	119,663
Semi-skilled impact on employment [job opportunities]	68,096	92,184	113,631	273,911
Unskilled impact on employment [job opportunities]	7,296	33,054	47,015	87,365
Impact on Households				R 69,156
Low Income Households				R 11,483
Medium Income Households				R 14,094
High Income Households				R 43,579
Fiscal Impact				R 31,762
National Government				R 29,310
Provincial Government				R 365
Local Government				R 2,087
Impact on the Balance of Payments				R 50,946

Source: Author's Computation Results

Figure 3: Table 3 :

4

Figure 4: Table 4 :

[Apr17] , Apr17 .

[Budget Review, Economic Overview. Republic of South Africa ()] , *Budget Review, Economic Overview. Republic of South Africa* 2019. South African National Treasury

[Quarterly Labour Force Survey, Quarter ()] , *Quarterly Labour Force Survey, Quarter* 2019. 1. (Statistics South Africa)

[Accelerated and Shared Growth Initiative South African Government ()] 'Accelerated and Shared Growth Initiative'. *South African Government* 2006.

[Fedderke et al. ()] *Challenging Cassandra: Household and per Capita Household Income Distribution in the October Household Surveys 1995-1999, Income and Expenditure Surveys 1995 & 2000, and the Labour Force Survey*, J W Fedderke , J Manga , F Pirouz . 2004. 2000. Working Paper Number 13. University of Cape Town and University of Witwatersrand

[Alarcon et al. ()] *Dynamic Social Accounting Matrix (DySAM): Concept, Methodology and Simulation Outcomes-The case of Indonesia and Mozambique*, J Alarcon , C Ernst , B Khondker , P D Sharma . 2011. Geneva. ILO (Employment Sector Employment Working Paper)

[Economic Impact Assessment of Hendrina Power Station Eskom Holdings SOC Ltd ()] 'Economic Impact Assessment of Hendrina Power Station'. *Eskom Holdings SOC Ltd* 2017. KPMG.

[Glennen ()] 'Energy Insecurity: The Danger of Foreign Investment in the Energy Sector'. C Glennen . *World Finance* 2017.

[Mbanda and Chitiga ()] *Growth and Employment Impacts of Public Economic Infrastructure Investment in South Africa: A dynamic CGE analysis*, V Mbanda , M Chitiga . 2013. (Working Paper)

[Serven ()] *Infrastructure and Growth*, L Serven . 2010. World Bank.

[Fedderke and Garlick ()] 'Infrastructure Development and Economic growth in South Africa: A Review of the Accumulated Evidence'. Fedderke , R Garlick . *Policy Paper No* 2008. 12. School of Economics, University of Cape Town and Economic Research Southern Africa

[Infrastructure: Maintenance will Keep the Lights Burning Bright Financial Mail and DBSA ()] 'Infrastructure: Maintenance will Keep the Lights Burning Bright'. *Financial Mail and DBSA* 2018. (Special Report)

[Aschauer ()] 'Is Public Expenditure productive?'. D Aschauer . *Journal of Monetary Economics* 1989a. 32 p. .

[Eskom] 'Kusile and Medupi coal-fired power stations under construction'. Eskom . *COP17 fact Sheet*,

[Eskom ()] *Kusile Unit 3 Synchronised to the National Grid 8 Months Ahead of Schedule*, Eskom . `http://www.eskom.co.za/news/Pages/2019` 2019.

[Eskom ()] 'Medupi Power Station Project'. Eskom . *Fact Sheet* 2014.

[National Development Plan 2030: Our Future -Make it Work ()] *National Development Plan 2030: Our Future -Make it Work*, 2012. Republic of South Africa. National Development Plan

[Power Sector Economic Multiplier Tools: Estimating the Broad Impacts of Power Sector Projects International Finance Corpora 'Power Sector Economic Multiplier Tools: Estimating the Broad Impacts of Power Sector Projects'. *International Finance Corporation* 2015. (Methodology. World Bank Group)

[Aschauer ()] 'Public Investment and Productivity Growth in the Group of Seven?'. D Aschauer . *Economic Perspectives* 1989b. 13 p. .

[Van Wyk et al. ()] 'Regional Economic Impacts of Events: A Comparison of'. L Van Wyk , M Saayman , R Rossouw , A Saayman . *Methods. SAJEMS NS* 2014. 2015. 18 (2) p. .

[Fathurrahman ()] *Simulating Indonesian Fuel Subsidy Reform: A Social Accounting Matrix (SAM) Analysis. The Graduate School of*, F Fathurrahman . 2014. Natural and Applied Sciences of Middle East Technical University

[Estache and Garsous ()] 'The scope for an impact of infrastructure investments on jobs in developing countries'. A Estache , G Garsous . *IFC Economic Notes. Note* 2012. 4.

[The State of South Africa's Economic Infrastructure: Opportunities and Challenges ()] *The State of South Africa's Economic Infrastructure: Opportunities and Challenges*, 2012. Development Bank of Southern Africa

[the theory and application of Input-Output Analysis ()] *the theory and application of Input-Output Analysis*, 2004. (Conningarth Economists)

[Munnell (1990)] 'Why Has Productivity Growth Declined? Productivity and Public Investment'. A Munnell . *New England Economic Review* 1990. Jan/Feb. p. .