THEME - SOUTH AFRICA AND BRICS: ENHANCING ECONOMIC COOPERATION IN THE RENEWABLE ENERGY SECTOR

TOPIC: FINANCING ENERGY TECHNOLOGIES IN THE BRICS

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KAMLESHAN PILLAY, CYRIL PRINSLOO, JAYA JOSIE AND FRANCK NAIDOO

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Abstract

The BRICS countries, in their development of sustainable economies, have equally been influenced by global dialogues and processes towards more equitable growth. Perhaps the most critical element in determining the transition of BRICS will be the transformation of their energy systems, while considering economic growth, environmental degradation and social considerations. The BRICS have traditionally relied on fossil fuels including coal, natural gas and oil for the generation of electricity; however, in recent times, the expansion of the renewable energy has become an important issue for the BRICS coalition. A significant barrier to the pursuit of a diverse energy mix aligned to climate policies consisting of nuclear, shale gas, coal and renewable energies is the availability of sustained financial flows. A lack of potential financing may be owing to difficulties in economic feasibility of certain energy projects. In cases where a business case is present, the absence of enabling government policies may also deter investors. From a private sector perspective, the capacity to package certain energy projects into dynamic business models is also a challenge. The focus of this research will be to investigate and evaluate these two critical points of uncertainties and the strategies that could be implemented to facilitate enhanced investment into diverse energy mixes and offer recommendations on this to policy makers across the BRICS countries.

1. Introduction

Domestically, each of the BRICS has made concerted efforts to increase the uptake of renewable energy. This has been done through both national planning, as well as creating a more enabling policy environment for green economic growth. Various economic incentives have been offered in the BRICS countries to drive growth in their respective RE industries. In 2015, the BRICS have also become some of the top global investors in RE, with all members excluding Russia within the global top 10 RE investors.[1] South Africa has made significant strides towards changing the electricity generation make-up of the country, by introducing nearly 10% of generation from renewable energy (RE) sources, particularly from wind and solar resources. Through its Renewable Energy Independent Power Producer Procurement Programme (REI4P), it managed to procure more than 6300 megawatts of renewable electricity, create 110 000 of employment opportunities, and attracted nearly R200 million worth of investments in South Africa. In addition to RE energy procured, jobs created, and investment attracted, the REI4P also had other positive impacts. Through the introduction of local content requirements in the programme, South Africa has created a burgeoning RE manufacturing sector. Yet, an analysis of South Africa's nascent RE manufacturing sector and RE market factors indicates that there is scope to grow this sector. The rapid expansion and resurgence of the RE sector in BRICS was largely due to the BRICS commitment to reduce carbon emissions in line with member countries international obligations given that China, India and South Africa are the biggest producers of carbon emissions in their respective regions because of their use of coal for electricity generation.

South Africa, India and China are the predominant users of coal for energy production while Russia possess large known coal reserves that could be exploited should their gas reserves not be economically viable in the future. In 2014, coal accounted for 93% of electricity generation in South Africa, 75.1% in India and 72.6 % in China (Figure 1).[2] In terms of coal mining production, China, India, Russia and South Africa are presently in the top ten producers globally.

Among BRICS countries South Africa ranks with China, India and Russia with large endowments of recoverable coal reserves. Russia has the second largest coal reserve after the USA, with China third and India fifth. In terms of production China is the global leader, with India third, Russia sixth and South Africa seventh. Perhaps one of the main reasons why growth has a decreasing effect on emissions in Brazil and Russia is that both these countries are less dependent on coal as a fuel source for energy production. Brazil is abundantly endowed with hydroelectric capabilities and Russia depends largely on its abundant natural gas reserves.

In order limit temperature increases to 2°C, investment in low-carbon power generation and energy efficiency would need to increase by 3 – 7 times (IEA, 2015). This will require additional investment of between 780 billion and 2.3 trillion USD by 2035 (IEA, 2015). There is general agreement within the research community that limiting global mean temperatures increases will be determined by the actions of the BRICS and other emerging economy coalitions. One of the major outcomes of the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP) 16 held in Cancun in 2010 was the need to mobilize at least 100 bn USD per year by 2020 through the Green Climate Fund (GCF). This outcome was endorsed by the Member States at the BRICS Summit and cited as being critical in implementing and financing climate change action. Despite this high-level acknowledgement from the BRICS, there is a still a high degree of uncertainty as to whether the

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[1] **FS/UNEP, 'Global Trends in Renewable Energy Investment 2016;, accessed 27 November 2016, http://fs-unep-centre.org/sites/default/files/publications/globaltrendsinrenewableenergyinvestment2016lowres_0.pdf**

[2] **World Bank Databank, *World Development Indicators*, http://databank.worldbank.org/data/reports.aspx?source=2&series=EG.ELC.COAL.ZS&country=#, accessed 25 May 2017.**

pledges for the GCF would be realized: Currently, developed country pledges to the GCF amount to US 12.3 Bn dollars. In the next two sections of this paper we will discuss the transition to renewable energy and financing of clean technologies for the production of carbon neutral electricity. The conclusion will make some proposals for energy policy in BRICS.

2. Energy and the BRICS

2.1. Transition towards Clean Technologies for Energy in the BRICS

China, India and South Africa are dependent on coal for electricity generation. It is reported that in 2012 coal accounted for 81% electricity generation in China, 68% in India, and 95% in South Africa. For South Africa in particular, despite a low ranking amongst its BRICS partners, it is the 12th largest CO_2 emitter in the world and represents half of all emissions for Africa. Adding fuel to fire South Africa's largest energy resource is coal with estimated reserves to supply domestic and export demand for another 200 years. The power sector in South Africa is responsible for 48% of emissions where coal leads 75% fuel demand, and accounts for 95% of the input in electricity production. The coal industry employs more than 139,000 workers; contributes about 1.8% to a low GDP of 2.8% in 2012, in an economy with an official unemployment rate above 25% percent.

Given the abundant reserves in BRICS and growing demand for energy, coal will remain the biggest input for energy production and electricity generation in the foreseeable future. In Eurasia Russia, with the second largest global reserves and increased demand from China, has already committed to increase coal output to 30% by 2030. Globally, despite intensive investment programmes in alternative sources of energy, coal inputs in energy production has increased from 23% in 2000 to 29% currently. Since 2007 coal is the dominant input in G20 energy production, and grew by 2.1% in 2013. Since 2000 world coal consumption has increased to 7.8 Gt in 2013. Reports indicate that since 2008 coal represents about 40% of global energy consumed and is the main contributor to world energy demand.

2.2. Energy Sources in the BRICS and Africa

Collectively, the BRICS have also tried to address related energy security challenges. Cooperation on energy has been a priority for the BRICS group since its first meeting in 2009, with the Yekaterinburg Declaration noting[3]:

> *"We stand for strengthening coordination and cooperation among states in the energy field, including amongst energy producers and consumers and transit states, in an effort to decrease uncertainty and ensure stability and sustainability. We support diversification of energy resources and supply, including renewable energy, security of energy transit routes and creation of new energy investments and infrastructure."*

This call for cooperation on energy was further strengthened by the BRICS Think Tank Council's report 'Towards a long-term strategy for BRICS' which highlights various areas for cooperation among BRICS countries. To foster competitiveness and complementarity among member countries, it recommends cooperation in energy. The document highlights that:[4]

> *'While bearing in mind that fossil fuel remains one of the major sources of energy, BRICS reiterates the belief that renewable and clean energy, research and development of new technologies and energy efficiency can be important drivers to promote sustainable development, create new economic growth, reduce energy costs and increase efficiency in the use of natural resources.'*

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[3] **BRICS, 'Joint Statement of the BRIC Countries Leaders', http://brics.itamaraty.gov.br/index.php?option=com_content&view=article&id=114, accessed 30 April 2018.**
[4] **BTTC, 'Towards a long-term strategy for BRICS', accessed 29 November 2016, http://www.ipea.gov.br/agencia/images/stories/PDFs/livros/livros/151104_brics_long_term_strategy.pdf**

Internationally in general, and BRICS in particular, there are significant ongoing investment programmes in renewable sources of energy. This has been done through both national planning, as well as creating a more enabling policy environment for green economic growth. Various economic incentives have been offered in the BRICS countries to drive growth in their respective RE industries. China today is a leading international producer of equipment for generating renewables. However, these programmes generate a fraction of the energy requirements in growing economies. Even in countries such as Germany where renewables are an increasing source of energy coal still remains a critical input in the mix. In the short to medium term the abundant supply of low cost coal will continue to be the most cost-effective input in the production of energy despite being responsible for 90% of the sulphur dioxide (SO_2) emissions, 70% of the dust emissions, 67% of the nitrogen oxide (NO_x) emissions, and 70% of the carbon dioxide (CO_2) emissions. This poses a threat to the environment, and we need to invest more than just lip service towards mitigating the effects from the use of this cheap fuel. Investment in clean technologies is often presented as the most effective way for reducing emissions in the use of coal for energy and electricity generation. In addition, and for Sub Saharan Africa in particular, the use of clean technologies in the use of coal, must be seen as part of a transition strategy towards mobilizing alternative sources of energy such as natural gas, hydro power, solar and wind power.

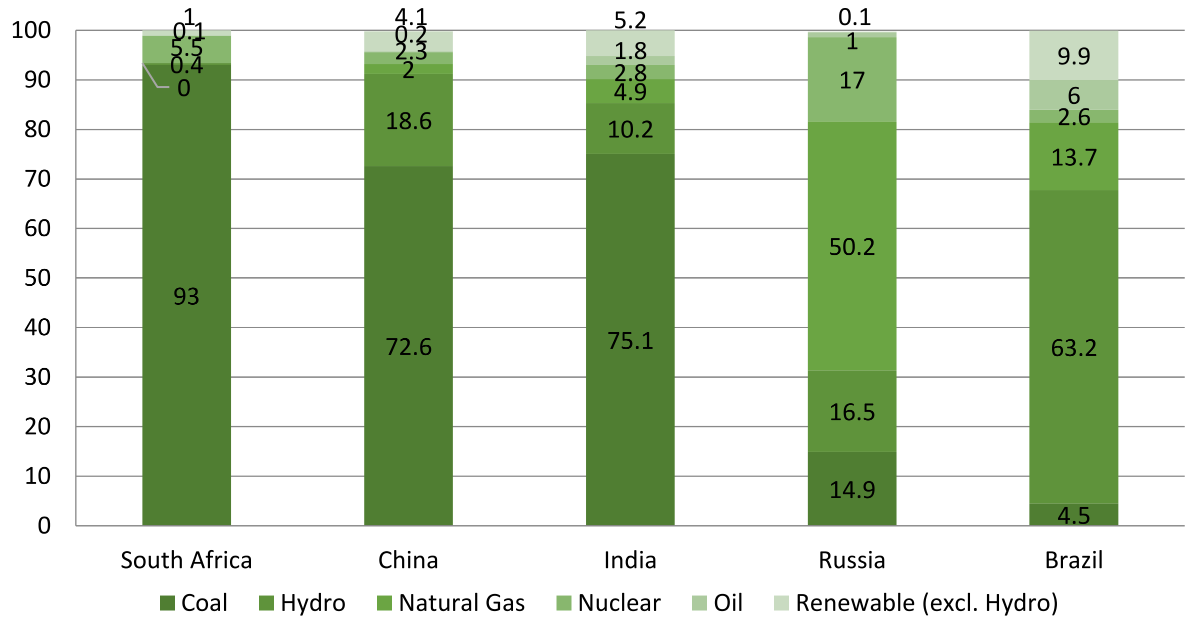
South Africa's energy strategy is captured in a policy that includes a mix of coal, RE, natural gas from shale, nuclear and hydroelectricity. Together with coal nuclear, shale gas and hydroelectricity are viewed as the main sources of base-load electricity with coal being the cheapest.

For RE Sub Saharan Africa disposes of large exploitable resources of solar, wind, natural gas, hydro and geothermal sources of energy. However, the 2014 *Africa Energy Outlook* (IEA, 2014) reported that of the 90GW on-grid power generation capacity in Africa in 2012 half was produced in South Africa. Forty-five percent of this capacity was produced from coal (mainly in South Africa), 22% from hydro, 17% from oil, and 14% from gas (mainly in Nigeria). While there has been considerable investment interest in solar and wind power more investment attention needs to be given to Sub Saharan Africa's natural gas and hydro power reserves. The International Energy Agency (IEA, 2014), estimated that Sub-Saharan Africa, would overtake Russia in natural gas supply over the next twenty-five years. The region is expected to produce about 175 billion cubic metres per year (bcm/y) by 2040. Much of this will be generated by Mozambique, Nigeria, Angola and Tanzania. For South Africa this is significant given that Mozambique, Angola and Tanzania are part of the Southern Africa Development Community (SADC). South Africa is already involved in the Mozambique natural gas programme.

Hydroelectric power is one of the least developed energy sectors in Africa although it accounts for almost 12% (283GW) of the world's hydropower potential. Despite having a technically viable production capacity of 1,200 TWh/year (8% of global technical potential), the continent generates only 3% of global hydropower and exploits less than 10% of its potential. This is considered the lowest regional proportion internationally. The low levels of exploitation and investment is surprising given that hydropower has the potential for large scale development and low average costs for electricity generation compared to other technologies (IEA, 2014). For South Africa and the BRICS countries the SADC region provides important opportunities for investment in hydropower. The DR Congo, Lesotho, Mozambique, Namibia, Angola and Zimbabwe have considerable potential for development. Currently, the main focus for investment that could promote growth and development in the regions has been the Inga III (4.8GW) and the Grand Inga (44GW) projects in the DR Congo. Potentially, the SADC connection offers South Africa in particular and BRICS countries in general an opportunity for entering into financing partnerships with the BRICS New Development Bank and other multilateral development banks (MDBs) for increased investment in natural gas and hydropower sources of energy.

Energy security which continues to be a significant concern in Africa could be managed by increased nuclear energy installation. According to Campbell (2018), 20% of the South African population still does not have access to electricity[5]. Acknowledging that future nuclear energy plans must be reliable, safe, clean and provide affordable power, nuclear in complement with renewables could offer a solution to the aging coal-fired power plants. Despite the inclusion of nuclear within National Government's Energy Plans, the installation of new build has been difficult. One of the major inhibitors to implementing nuclear energy systems is the constant notion that renewables cannot work in complement with nuclear energy. According to Kilian (2018), if nuclear is to be integrated into the energy mix then it is essential that financing, technology and communication be adapted[6]. Kilian (2018) also noted that the significant initial capital costs should not be a deterrent as the operating and maintenance costs once a facility is built can be affordable.

Figure 1 - BRICS Electricity Production from Various Sources, % of Total (2014)



Source: World Bank Databank, *World Development Indicators*

2.3. Renewable Energy Trade and Investment in the BRICS

South Africa's nascent RE manufacturing and services sector can benefit from intra-BRICS cooperation. As highlighted earlier, all the BRICS have shifted their focus and policies to more sustainable sources of electricity generation. This has resulted in burgeoning manufacturing hubs in these technologies.

A macro level overview of the solar and wind manufacturing VCs across the BRICS illustrates the complementarity of these VCs. The table below highlights several areas where BRICS can cooperate, specifically in the manufacturing of polysilicon, ingot and wafer production. Table 1 indicates that production capacity for these products exists in India and China, but not yet in South Africa, Brazil and Russia. At the same time, while the other BRICS have well-developed wind turbine manufacturing sectors, South Africa does not yet have the capacity to manufacture blades, gearboxes and turbines. Cooperation in this regard can focus on knowledge sharing, investment or trade.

[5] http://www.engineeringnews.co.za/article/south-africa-will-need-more-power-generation-for-itself-and-for-region-consultant-2018-05-17

[6] http://www.engineeringnews.co.za/article/nuclear-renewables-must-complement-each-other-in-south-africa-cilliers-2018-05-17/rep_id:4136

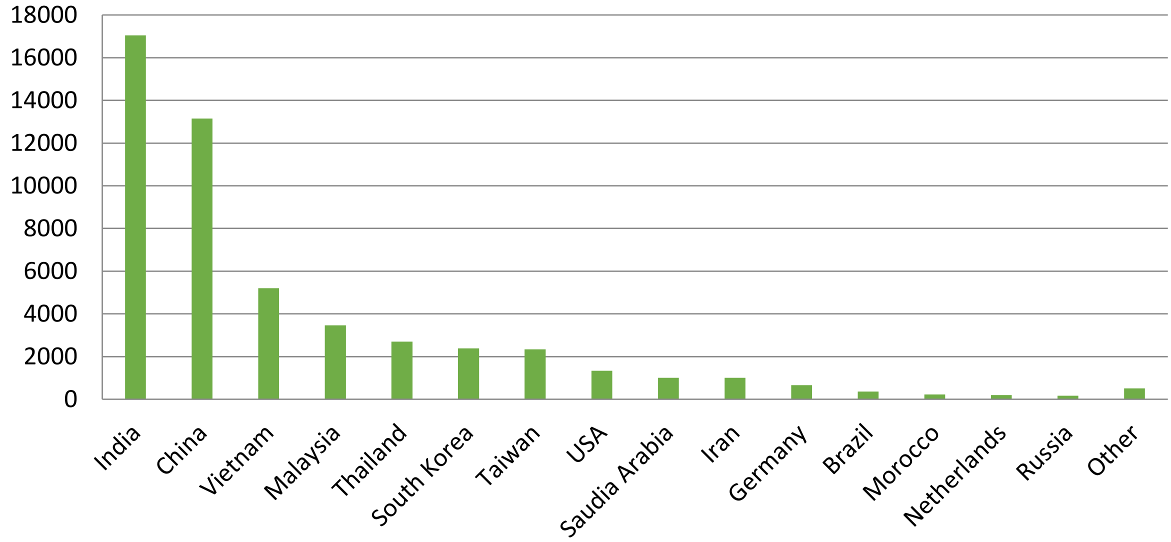
Table 1 – Solar and Wind Value Chains in BRICS

Sector	Value Chain Segments	B	R	I	C	S
		Availability				
Solar	Balance of plant	√	√	√	√	√
	Cells		√	√	√	√
	Engineering	√	√	√	√	√
	Inverters	√	√	√	√	√
	Modules	√	√	√	√	√
	Operation & Maintenance	√	√	√	√	√
	Project development	√	√	√	√	√
	Polysilicon/ingots			√	√	
	Wafers			√	√	
Wind	Balance of plant	√	√	√	√	√
	Engineering	√	√	√	√	√
	Operation & Maintenance	√	√	√	√	√
	Project development	√	√	√	√	√
	Towers	√	√	√	√	√
	Blades	√	√	√	√	
	Gearboxes	√	√	√	√	
	Turbines	√	√	√	√	

Source: Climatescope, 'Value Chains', http://global-climatescope.org/en/results/, accessed 30 April 2018.

Currently, China is the largest solar PV manufacturer globally accounting for more than 60% of total global production. China has emerged as a global leader in PV production, offering PV modules at 30% lower than similar models from EU and Japan.[7] Planned investment in PV manufacturing in other BRICS countries are however ramping up considerably, with India, Brazil and Russia within the top 15 planned countries (Figure 2).

Figure 2: Total PV Manufacturing Capacity Announcements by Country (GW, 2016)

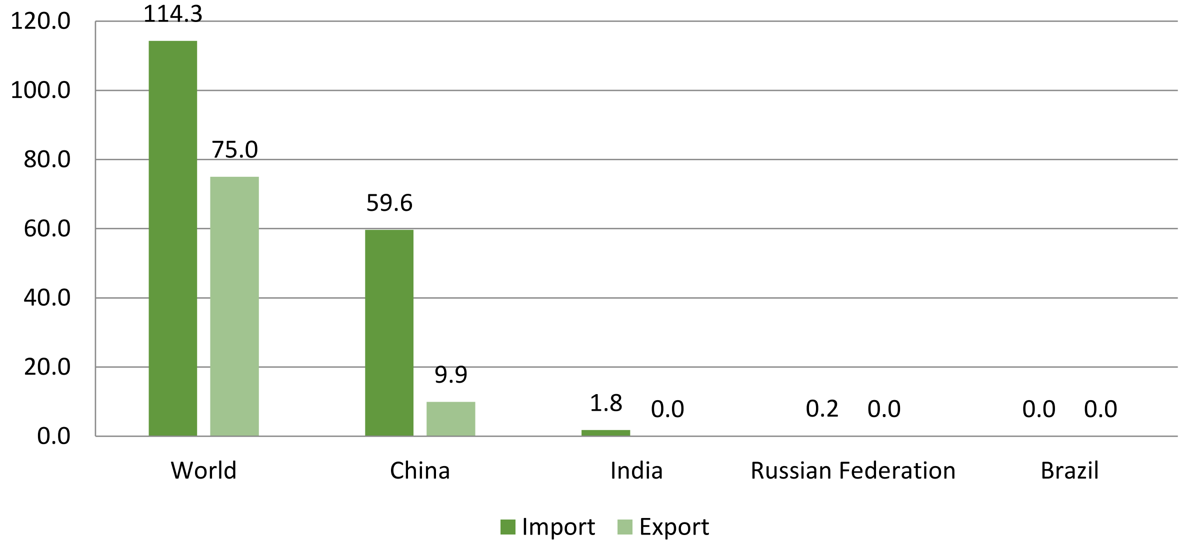


Source: Osborne M, 'Key solar manufacturing location trends in 2016', https://www.pv-tech.org/news/key-solar-manufacturing-location-trends-in-2016, accessed 30 April 2018.

[7] **World Wildlife Fund, *op. cit.***

Despite this, apart from trade with China, South Africa's intra-BRICS trade in solar PV modules remains low. Figure 3 highlights South Africa's trade in solar PV modules with the BRICS. More than half of South Africa's PV modules are sourced from China. However, very little modules manufactured in South Africa is exported to the other BRICS countries. While this limited analysis focusses only on one item within a solar PV system (albeit a core one) similar analysis is likely to reveal other sectors within the value chain where greater complementarity lies.

Figure 3: SA - BRICS Trade: HS854140 Photosensitive Semiconductor Devices ($ million, 2017)



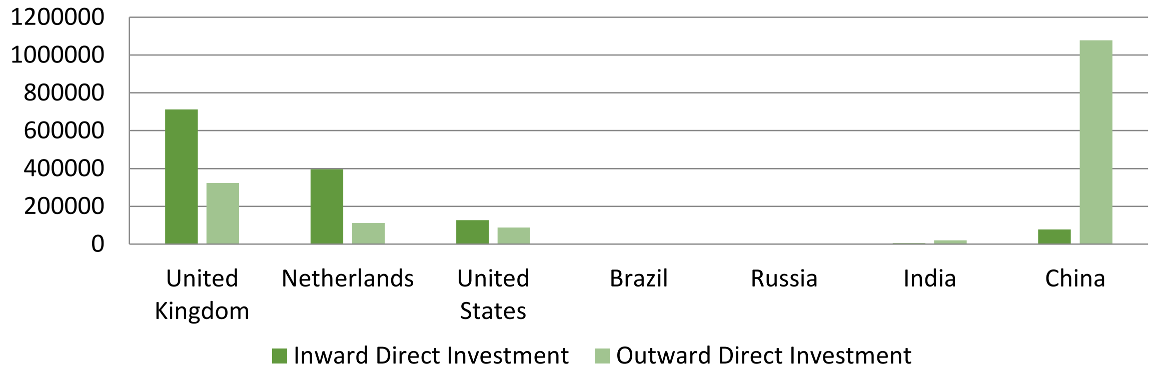
Source: TradeMap, 'List of supplying markets for a product imported by South Africa: Product: 854140 Photosensitive semiconductor devices, incl. photovoltaic cells whether or not assembled in modules or made up into panels; light emitting diodes (excluding photovoltaic generators)', https://www.trademap.org, accessed 30 April 2018[8]

Historically, investment from the BRICS into South Africa has remained extremely low, especially relative to some other key economic partners (Figure 4). Again, the exception here is South Africa's engagement with China, where much is concentrated in media and information and communication technology sectors. Investment from Brazil and Russia is marginal and does not register in the South African Reserve Bank's Quarterly Reports. There is a need to scale up investments across the BRICS. This will increase trade flows. This will likely also address the structural nature of South Africa's trading relationship with the BRICS. Currently, South Africa exports primarily raw commodities and import manufactured goods. Investment into the value chains of different countries will enhancing more equitable trade amongst BRICS.[9]

[8] **Product: 854140 Photosensitive semiconductor devices, incl. photovoltaic cells whether or not assembled in modules or made up into panels; light emitting diodes (excluding photovoltaic generators)**

[9] **Prinsloo, Boosting South Africa's Economic Relations with the BRICS', http://www.igd.org.za/jdownloads/Global%20Insight/Boosting%20South%20Africaa%20s%20Economic%20Relations%20with%20the%20BRICS%20By%20Cyril.pdf, accessed 30 April 2018.**

Figure 4 - South Africa's Foreign Assets and Liabilities, Select Countries (2016, R millions)



Source: South African Reserve Bank, 'Quarterly Bulletin: March 2018' https://www.resbank.co.za/Lists/News%20and%20Publications/Attachments/8334/08Statistical%20tables%20%E2%80%93%20International%20economic%20relations.pdf, accessed 30 April 2018

2.4. Renewable Energy in South Africa

South Africa's current electricity generation composition is highly defined by its history and availability of domestic resources. Due to its apartheid policies throughout the latter part of the 20th century, South Africa faced significant economic sanctions, which hindered access to external energy resources. South Africa's energy policy was therefore defined on independence from external suppliers to ensure domestic energy security.[10] This, combined with significant coal deposits, led to heavy focus and investment in coal technologies for electricity generation. The introduction of multiparty democracy in the country witnessed the end of economic sanctions, yet the energy path dependency created by apartheid's legacy remained in-tact. However, towards the mid-2000s, several factors altered South Africa's electricity policy. These factors included:

- Energy Diversification and Security - The 2008 energy crises in South Africa highlighted the need to ensure electricity supply by ensuring adequate infrastructure is in place, ageing infrastructure is updated, supply and demand are adequately forecasted and balanced; and growing demand is catered for.[11]
- Climate Change - South Africa, reliant on 90% of its electricity generation from coal, is a major emitter of carbon dioxide. The drive towards more sustainable economic growth and ratification of the Paris Climate accord has made the government reconsider its carbon dioxide emissions. Its Integrated Resource Plan (IRP) 2010 – 2030 was the first time IRPs recognised this, incorporating a carbon emissions cap, and integrating renewable energy (RE) options to address emissions, including procurement of nearly 30 gigawatt (GW) solar and wind electricity by 2030.[12]
- Industrialisation and job creation - RE is also very much driven by the need to create jobs in the country. For example, when South Africa hosted the United Nations Conference of the Parties in Durban in 2017, there was a commitment by public and private stakeholders to ensure government achieves its goal of creating 300000 'green jobs' by 2020.[13] The government also recognised that many RE projects – due to the off-grid/rural location of many

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[10] Nel D, 'Risks and barriers in renewable energy development in South Africa through Independent Power Production', https://repository.up.ac.za/bitstream/handle/2263/58148/Nel_Risks_2015.pdf?sequence=1, accessed 30 April 2018.
[11] *Ibid.*
[12] Eberhard A, Kolker J, and Leigland J, 'South Africa's REenwable Energy IPP Procurement Program: Success Factors and Lessons', https://www.gsb.uct.ac.za/files/ppiafreport.pdf, accessed 30 April 2018.
[13] *Ibid.*

– has the potential to drive economic growth and development outside of traditional main areas of economic activity.[14]

- Constrained Fiscal Space - Low economic growth resulting in a tighter fiscal environment, combined with constrained position of the main energy utility, Eskom, has driven the need for greater private sector investment in the energy sector in South Africa[15].

South Africa's Integrated Resource Plan 2010 – 2030 – detailing future electricity demand and supply response from the government – reflected these changes, noting that South Africa's future electricity security need to 'achieve a balance between an affordable price for electricity to support a globally competitive economy, a move to a more sustainable and efficient economy, a move to create local jobs, the demand on scarce resources such as water and the need to meet nationally appropriate emissions targets in line with global commitments'. In line with these objectives, the 'high' projections of the plan estimated that South Africa would by 2030 need to commission 17,6GW wind power and 11,3 GW solar power.[16] As a result, South Africa introduced two key policy initiatives with a specific focus on RE that would redefine its approach to electricity generation.

Driven by the above-mentioned factors, the government worked towards creating a policy programme of Renewable Energy Feed-In Tariffs (REFITs) to incentivise private financiers to enter the RE sector. It was adopted by the National Energy Regulator of South Africa (NERSA) in 2009. FITs have the benefit of offering private investors security of investment through long-term supply contracts at predetermined prices. This policy was a popular method globally to incentivise private investors. Yet, one shortcoming of FIT-programmes is that they do not offer a competitive bidding process which would allowing markets to set RE tariffs and has the potential to lower buying costs. The Department of Energy (DoE) – which sets energy policy in South Africa - abandoned this process in 2011 without a single megawatt being procured under REFIT in favour of a competitive bidding process. It's replacement, the Renewable Energy Independent Power Producer Procurement Programme (REI4P), was announced in August 2011.[17]

The REI4P was developed and managed by several stakeholders involved in the electricity sector in South Africa, including Eskom (energy utility), the Department of Energy, NERSA, the National Treasury and the Development Bank of Southern Africa. Under the programme, private firms submitted bids detailing RE generation projects, detailing the structure, legal qualifications, environmental assessments, financial, technical and economic development details, as well as a guarantee from a financial service provider that funding for the project has been secured.[18] Bids were evaluated on a 70/30 split for price and economic development considerations (including job creation, local content, ownership, enterprise development and socio-economic development, among others).[19] Eskom in turn, signed power purchasing agreements (PPA) with successful bidders and the DoE offered a sovereign guarantee in case Eskom defaulted on PPA payments.

The REIPPP worked through successive windows to procure electricity from independent power producers (IPP). Through successive bidding windows (BW) government stakeholders and policy makers had the opportunity to learn and adjust requirement from the programme. Within four years, the programme managed to procure more than 6300MW of renewable electricity, create 110 000 of

[14] ***Ibid.***
[15] **Nel, *op cit.***
[16] **Department of Energy (a), 'Draft Integrated Electricity Resource Plan for South Africa - 2010 to 2030',**
http://www.energy.gov.za/IRP/irp%20files/Executive_Summary_Draft_IRP2010_22Oct2010.pdf, accessed 30 April 2018
[17] **Eberhard A, Kolker J, and Leigland J, *op. cit.***
[18] ***Ibid***
[19] ***Ibid.***

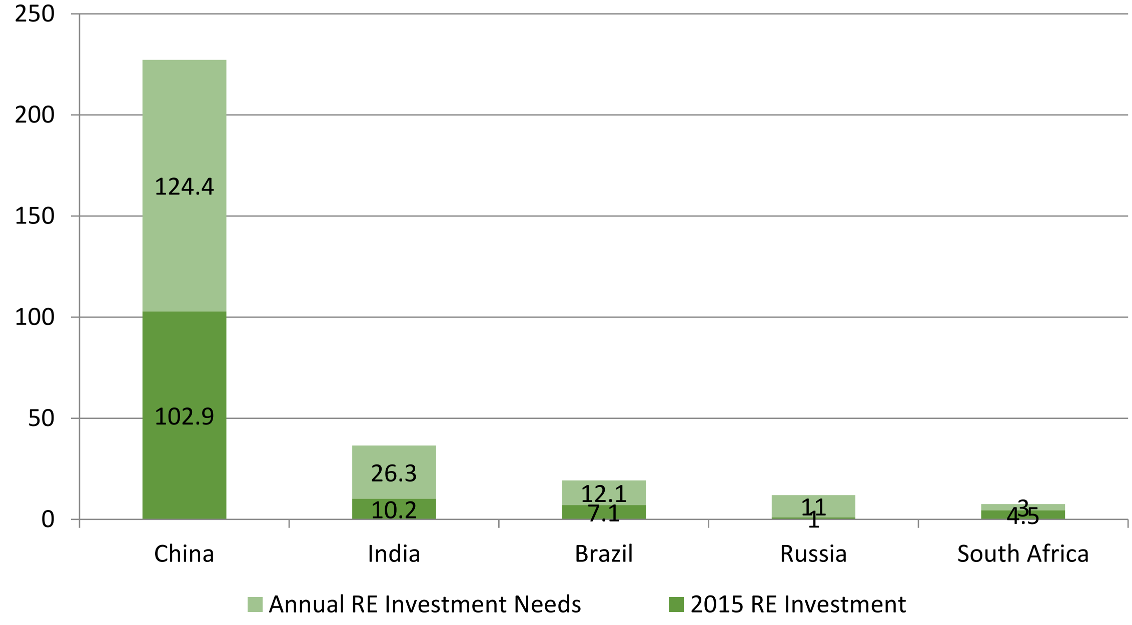
jobs, and attracted nearly R200 million worth of investments in South Africa. The programme has been hailed as one of the best electricity procurement models globally.[20]

[20] **Eberhard A and Naude R, 'The South African Renewable Energy IPP Procurement Programme: Review, Lessons Learned & Proposals to Reduce Transaction Costs', https://www.gsb.uct.ac.za/files/EberhardNaude_REIPPPPReview_2017_1_1.pdf, accessed 30 April 2018.**

3. Financing Energy through a Climate Lens

Within the Ufa Declaration in 2015, the BRICS Heads of States stated that the commitment of the coalition to combating climate change and aligning with the UNFCCC. Furthermore, the commitment mentioned the need to focus on energy efficient technologies and the encouraging investment for renewable energy. Despite the statements of the coalition at the BRICS Summit, it is likely that the BRICS will remain reliant on coal for energy production. South Africa, India and China are the predominant users of coal within the BRICS with Russia possess large coal reserves which may used to diversify their energy mix in the future. The emissions profile of the BRICS is possibly offset by the fact that Russia and Brazil are dependent on natural gas and hydro for their electricity generation needs. In terms of the energy mix, coal account for 81%, 68% and 95% of the electricity generation in China, India and South Africa, respectively.

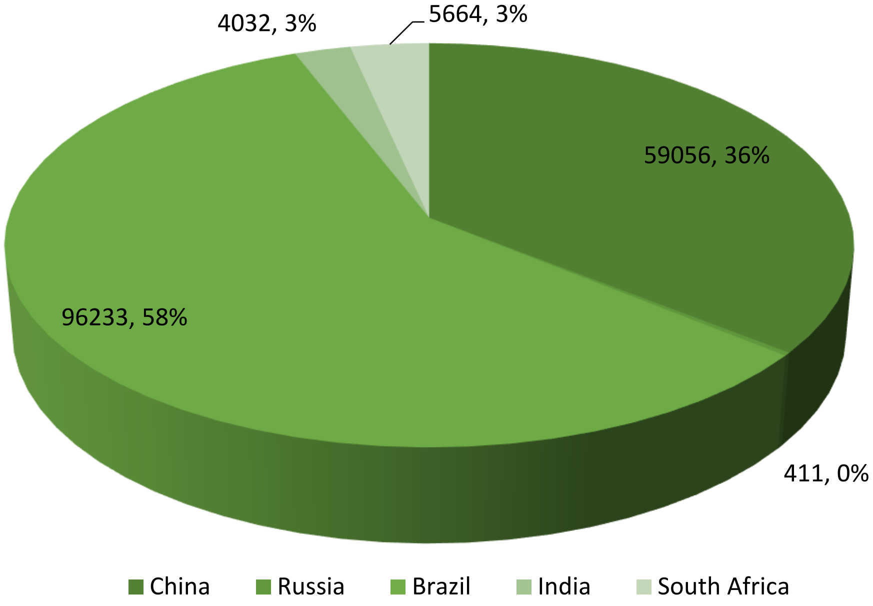
Figure 5 Annual RE Investment Needs vs. Current RE Investment Flows



Source: (IEEFA, 2015)

As a coalition, the BRICS have set a target of 1250 GW on installed clean energy capacity between 2020 and 2030 which was estimated to cost approximately USD 975 mn. To meet this target, the BRICS must spend USD 177 bn dollars annually. According to the McMullen-Laird (2016), the BRICS face an annual funding shortfall to meet their projected demand for clean energy of 51 bn USD. It must be noted that four out of the five BRICS Member States are still amongst the top 10 countries for Renewable Energy Investment despite falling short of their annual spend of renewable energy. From an inter-BRICS perspective, investment in RE is highest in China and Brazil (Figure 5) while Russia possesses the lowest RE investment flows (World Bank, 2018). Figure 6 shows the renewable energy annual investment target and the current spend within each BRICS Member States (IEEFA, 2016).

Figure 6: Annual RE Investment Needs vs. Current RE Investment Flows



Data Source: (IEEFA, 2016)

3.1. Renewable Energy Financing in South Africa

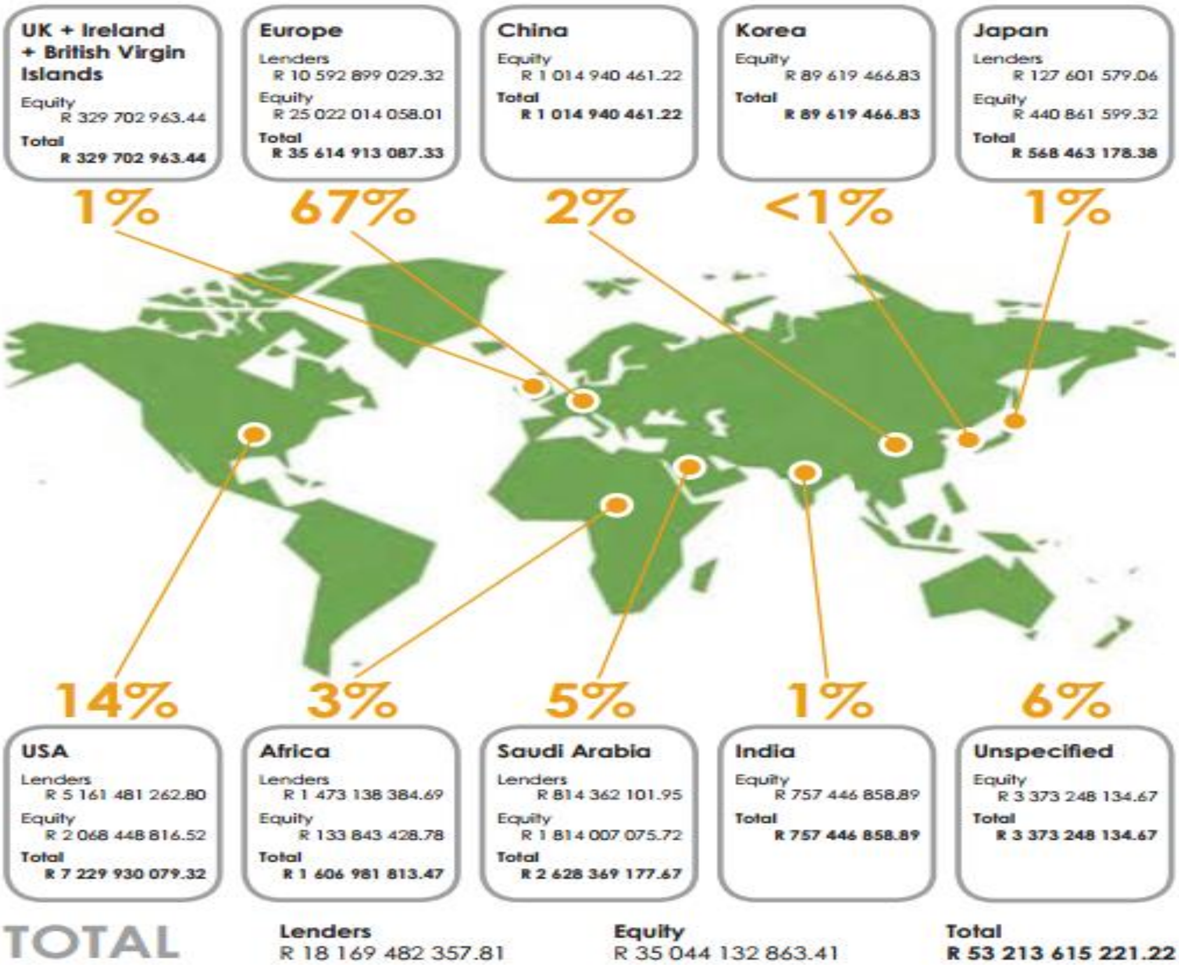
The constrained fiscal space of the state and Eskom was a key driver of the RE sector and subsequently at the core of the REI4P was to procure electricity from the private sector. In addition to private sector investment, this also offered other advantages. As Eskom highlighted, inviting the private stakeholders to the RE sector will 'reduce the funding burden on Government, relieve the borrowing requirements of Eskom, and introduce technologies that Eskom may not consider part of its core function'[21] Eskom's specialisation has long been in coal, thus it was not necessarily best placed to drive investment and innovation in the RE sector.

Nearly 30% of the R200 million investment attracted through REI4P-projects came from international sources. This share has increased over various BWs of the REI4P from less than 20% in BW1 to more than 30% in BW4 as the REI4P was increasingly recognised for its transparency, predictability and efficiency, signalling a high level of confidence from external investors in South Africa.[22] Financing was primarily from European countries (67% of external financing) and the United States (14%). Investment from other BRICS countries were marginal, with external investment from China 2% and India 1% (Figure 7).

Figure 7 – External Financing of REI4P projects

[21] Nel, *op cit.*

[22] **Department of Energy (b), *op. cit.***



Source: Department of Energy (b), 'State of Renewable Energy in South Africa', http://www.energy.gov.za/files/media/Pub/State-of-Renewable-Energy-in-South-Africa.pdf, accessed 30 April 2018.

The remaining 70% of the R200 million investment attracted through REI4P-projects came from domestic sources, indicating the significant appetite and financial capacity from domestic financiers to support sustainable development projects. South African financial institutions were fundamental in the REI4Ps success. As arguably the most sophisticated financial market on the continent, it had the financial capacity to support projects under the REI4P, and technical capacity (understanding project finance and experience with public-private partnerships) to support REI4P projects.[23] While South African banks illustrated some level of innovation (offering longer term loans of 15 – 17 years) there is certainly scope to increase innovation in this sector considering that the state remains fiscally constrained, yet the need for infrastructure investment remains. While institutional investors were also involved, their involvement remained marginal, especially considering more than R3 trillion worth of investments are held by pension funds in South Africa.[24]

Much of the success of the REI4P was based on the impetus from government to develop RE in South Africa. However, following four highly successful BWs, momentum towards public-driven RE development has since slowed. According to current DoE director-general, Thabane Zulu, the RE sector experienced a period "stop-start" policy implementation.[25] While PPAs were completed with winning bids from the first three BWs within months of award, there was a reluctance of government to sign the PPAs with winners in the final round of the REI4P. Reluctance was driven by various factors:

[23] Eberhard A, Kolker J, and Leigland J, *op. cit.*
[24] World Wildlife Fund, *op. cit.*
[25] Creamer T, 'High Priority IRP update to be published soon', http://www.polity.org.za/article/high-priority-irp-update-to-be-published-soon-2018-04-10, accessed 30 April 2018.

Eskom signalling an oversupply of electricity; revisions to the IRP; and labour unions insisting that increased RE sector activity would negatively affect employment in the coal industries that they represent.

Renewed effort has been undertaken by the DOE to boost confidence in the RE sector - starting by signing the outstanding PPAs of winning bidders of BW4 in April 2018. An updated IRP 2017 is currently (as of April 2018) in development to consider revised electricity supply and demand factors to ensure future planning is more accurate.[26] This, combined with an uptick in economic growth forecasts for South Africa, growing domestic industrial- and residential markets of the RE sector, support and facilitation offered by other ministries, and significant expansion opportunities for South African RE firms across the rest of the continent, will ensures that opportunities abound for South African firms across the RE value chain in the future.

3.2. Barriers to Energy Financing in the BRICS

There are various barriers to the implementation and financing of RE in the BRICS. The paragraphs below outline the significant barriers in each BRICS nation.

Russia: Sanctions on Russia and the low oil and gas price has created tough investment conditions for RE. Furthermore, public revenue through taxes are highly dependent on the oil and gas sectors which restrict the political will and desire to transition to an energy mix with a greater portion of RE sources. According to McMullen-Laird (2016), Russia's goal of 4.5 of hydropower within the energy mix by 2020 has already been moved back to 2024[27].

China: Despite China significant investment in domestic RE, an effective policy framework has resulted in less utilization of available wind and solar energy which has suppressed the appetite of investors. The steadily falling solar and wind prices would help China to meet their solar energy target by 2020 at a cheaper cost (McMullen-Laird, 2016).

Brazil: There is political will for the implementation of RE with the Brazilian Development Bank (BNDES) stating that it will continue to fund solar PV and wind projects while limiting loans for gas and hydro (McMullen-Laird, 2016). The current state of the Brazilian economy may be the most crucial factor in influencing inflows of investment as these pose significant deterrents to the private sector.

3.3. Climate change as an energy financing opportunity

According to CPI's 2017 climate finance landscape report, most climate finance flows are realized within the renewable energy sector.[28] This is owing to the possibility of greater financial returns being realized by the sector as the outputs are tangible (e.g. renewable energy output). Considering this, climate finance instruments may be a useful modality to leverage additional flows for RE implementation in the BRICS. As illustrated in Figure 7, all the BRICS member states have managed to access the global climate funds to varying degrees. Brazil has managed to access the greatest amount of finance (1 957 Mn USD) while Russia has only accessed 346 Mn USD. Furthermore, BRICS Member States have received significant portions of the total financing provided by most Climate Funds (with the exception of the Adaptation Fund). As shown in Figure 7, 17%, 18% and 46% of financial flows with

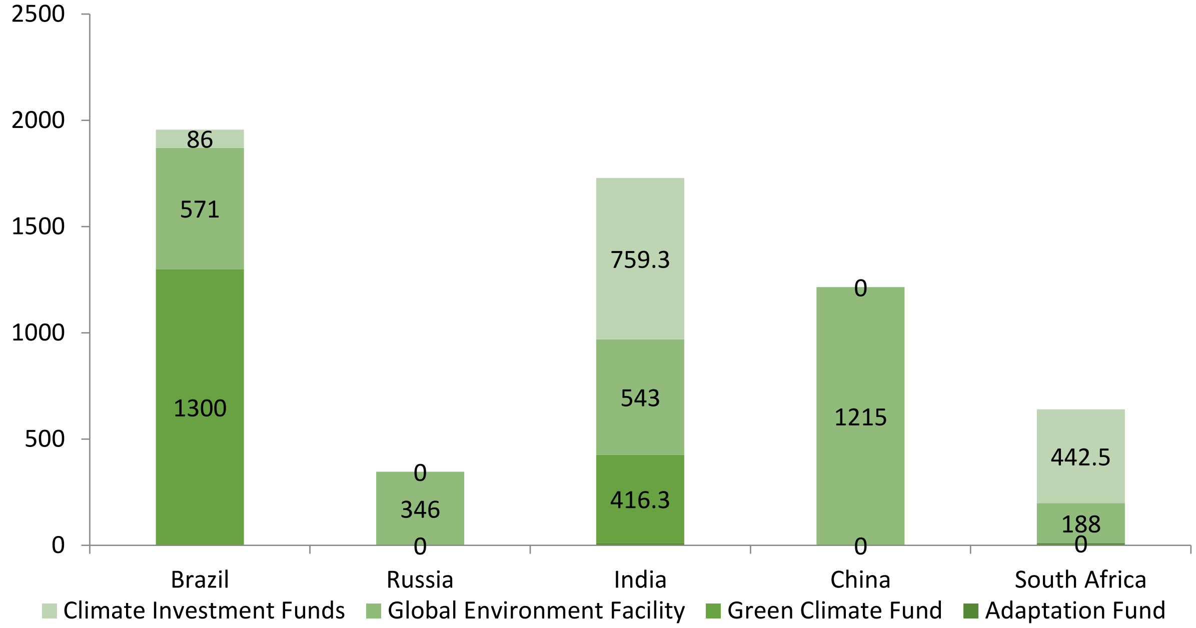
[26] ***Ibid.***

[27] **McMullen-Laird, L., (2016) https://thediplomat.com/2016/11/brics-face-51billion-annual-shortfall-for-clean-energy/. Date Accessed: 15 April 2018.**

[28] **Buchner, B., Oliver, P., Wang, X., Carswell, C., Meattle, C., and Mazza, F., (2017). Global Climate Finance Landscape Report 2017. Climate Policy Initiative.**

the GCF, GEF and CIFs have been allocated to BRICS Member States, respectively. Considering that most BRICS Member states are currently experiencing tough economic conditions, the use of climate finance can help address investor risks by developing blended finance models. Blended finance can be defined as the use of development finance, philanthropic funds and other public funds to mobilize private capital[29].

Figure 7 – Climate finance received by BRICS member states through international climate funds.

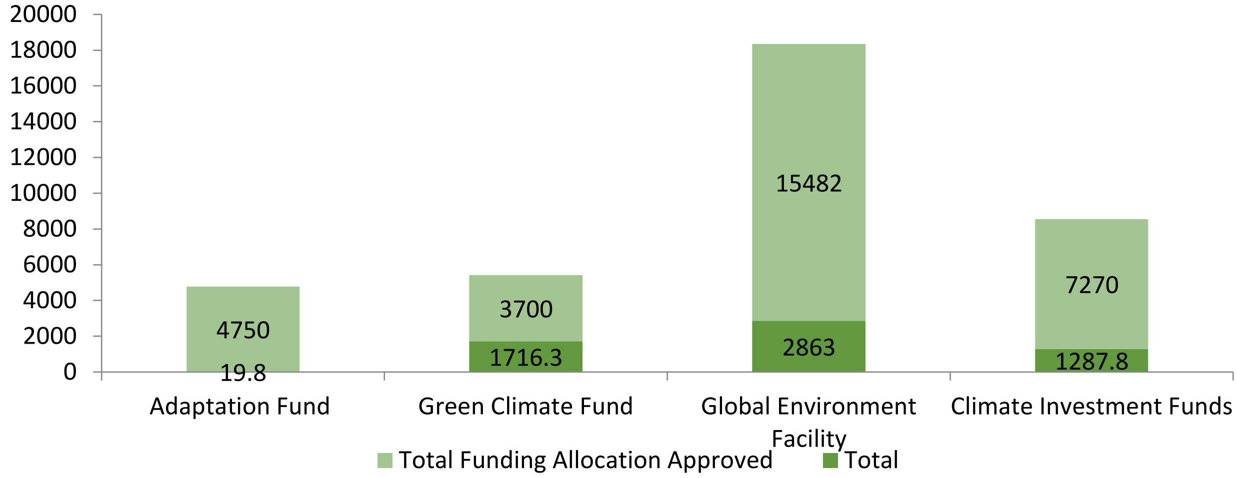


Data Source: CIF, GEF, GCF and AF databases.

Even though multilateral and bilateral climate funds are useful sources of finance for RE investment, the flows from these mechanisms may be limited in the future. The GCF was envisioned to mobilize 100 billion USD per year; currently, the fund has only received pledges worth 10.2 bn USD in total. Future pledges from the US may also be limited owing to the changes in political administration. The Adaptation Fund which is financed partially by sales of carbon credits from the Clean Development Mechanism (CDM) may not continue as the CDM is linked to the Kyoto Protocol which has now been replaced by the Paris Agreement. In the light of these potential restraints, it is essential that other financial instruments which have the potential to access different markets be assessed to widen the pool of potential flows for RE investment.

[29] http://www.oecd.org/dac/financing-sustainable-development/development-finance-topics/blended-finance.htm

Figure 8 – Proportion of climate finance provided by climate funds for the BRICS member states relative to total funding flows.



Data Source: CIF, GEF, GCF and AF databases.

3.4. Climate Finance Instruments for the Energy Sector

The selection of an appropriate financial instrument/s is usually dependent on the proposed project and related funding participants. That is, the selection of appropriate financial instruments is a highly context specific exercise which requires careful consideration of the project characteristics as this will determine the form of financial support to be requested. There are various perspectives from which financial instruments can be compared and a number of considerations to take into account when selecting financial instruments. From a financial perspective, instruments can be broken down into cost-reducing and risk-reducing categories (Torvanger *et al.*, 2016).[30] Cost reducing instruments directly reduce the financial costs of a project. Risk-reducing instruments reduce the risks of investments. Both are intended to make projects more attractive to investors.

Whether the intended project is an adaptation or mitigation project, is another consideration. Contrasting the use of instruments from a mitigation or adaptation perspective focuses on issues of return on investment, bankability, climate impacts and intangibility (i.e. the inability to assess the value gained from engaging in an activity using any tangible evidence). In the case of adaptation projects, it may be difficult to assess the associated economic costs and benefits to provide insight into the business case, which may deter private investors. Furthermore, considering that adaptation projects are typically localised and lack a revenue stream, mitigation projects are often favoured by the private sector. Co-financing for adaptation projects can be attained from other financial actors such as MDBs, International Organisations and other National Governments.

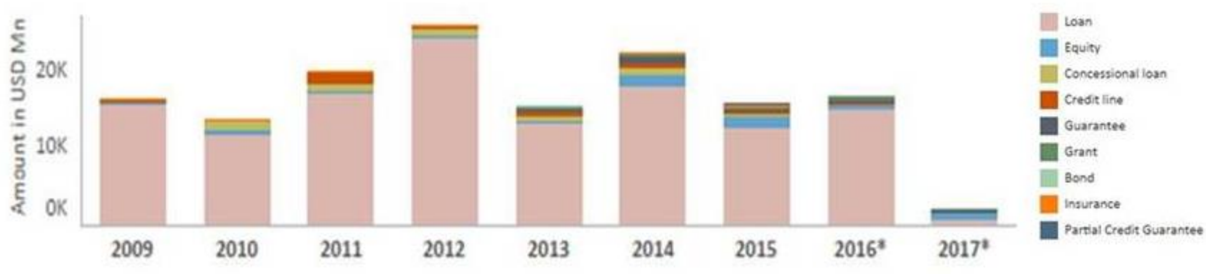
Going beyond the aspects of project type, i.e. mitigation and adaptation, the evaluation of financial instruments within the context of different sectors can illuminate which instruments to focus on, in order to attract increased participation from other financial actors (private sector, MDBs, International Organisations and National Governments). Different sectors are exposed to different risks (market, commercial, political, physical, and outcome risks) and therefore require tailored instruments to

[30] **Torvanger, A., Narbel, P., and Pillay, K., (2016). Tools and Instruments for the Mobilization of Climate Finance in Norway. Ministry of Foreign Affairs.**

ensure efficiency and effectiveness. For example, sustainable forestry industry facing commercial risks may require grant financing to reduce investment risks thereby attracting the private sector whereas the renewable energy sector competing with fossil fuel industries (which may be subsided by governments) may require guarantees to attract other investment. It must be noted that the use of instruments may also differ within a sector and subsector level. For example, within the renewable energy sector, geothermal energy project developers may require guarantees to cover themselves for risks associated with prospecting new drilling sites to ensure private sector participation, while the solar energy project types may seek loan financing from commercial banks to raise capital for construction and operating costs.

Figure 9 provides a global breakdown of financial instruments that have been used to provide support for RE investments. It is clear from the analysis that most financial support is provided in the form of loans. This suggests that the provision of financing is to support the capital costs of the hard RE infrastructure as opposed to creating an enabling environment for private investment. As stated by IEEFA, the increased investment risk coupled with less developed debt and equity markets in the BRICS results in less ability to attract private investors.

Figure 9: Renewable Energy financing subset by instrument



Data Source: IRENA

3.5. Innovative Climate Finance Approaches

Considering the vast financing needs, it is essential that private and public sector actors be involved. Green bonds could be useful investment products to stimulate financial flows. The green bond market has grown substantially in the last five years with both the unlabelled and labelled green bonds are estimated to be worth 895 bn USD dollars (CBI, 2017, Figure 10). Green bonds can be described as traditional vanilla bonds with proceeds earmarked for green initiatives. According to the State of the Green Bond Market report released by the Climate Bonds Initiative, the green bond labelled market is currently worth 201 bn USD and growing. The BRICS countries have had considerable involvement in the green bond market. In 2017, China's total green bond issuances was 37.1 bn USD while Brazilian and Indian labelled green bonds accounted for 3.67 bn and 3.2 bn USD, respectively. Currently, China and India are within the top 10 issuers of green bonds globally. Cumulative issuance of green bonds in China totalled more than $40 billion, with half of that issued in 2017 alone. India's cumulative issuances totalled nearly $10 billion, while Brazil's green bond issuance exceeds $3.5 billion through nine issuances.[31] South Africa has also had a strong involvement in the green bond market with two municipalities (City of Cape Town and the City of Johannesburg) issuing green bonds in 2014 and 2017, respectively and Growthpoint Properties issuing the first corporate green bond in 2018.

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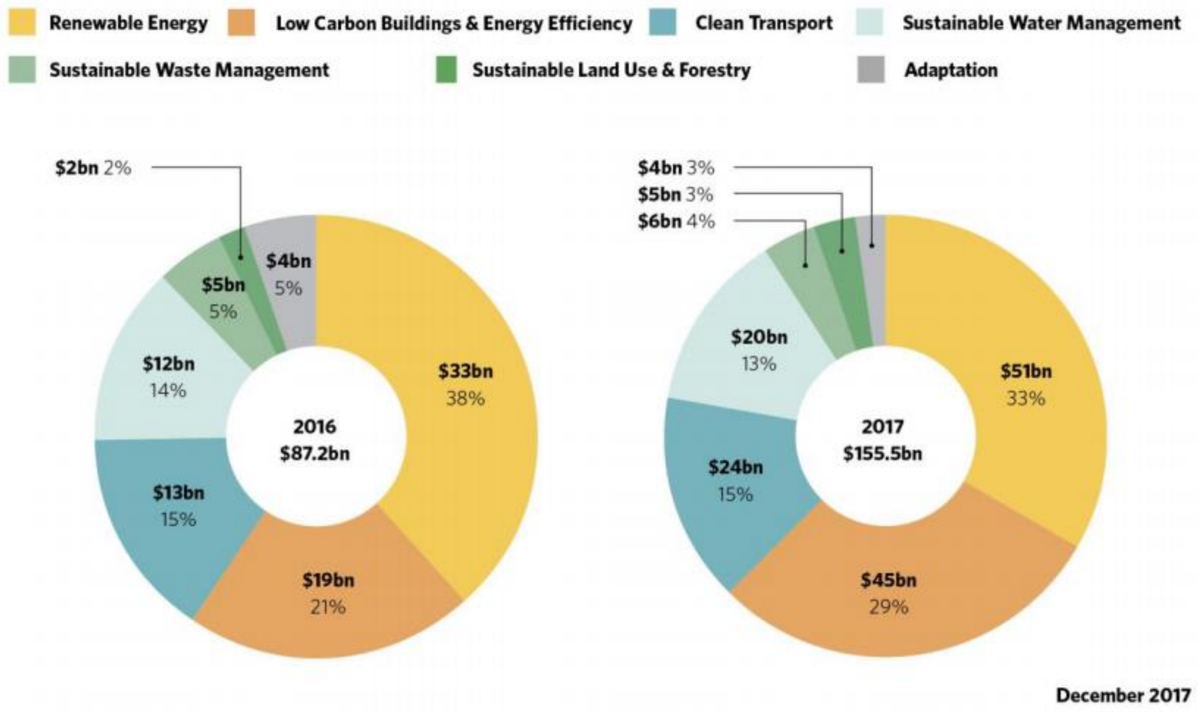
[31] **Climate Bonds Initiative, *Brazil green bond issuance exceeds $3.5bn – Brazil Edition of State of the Market*, https://www.climatebonds.net/files/files/Media%20Release_SOtM_BrazilEdition_EN_London_041017.pdf, accessed 29 March 2017.**

One of the major barriers to scaling up the green bond market is a global consensus on what is defined as 'green'. This definition is of critical importance as it defines the use of proceeds within the Green Bond Framework as well as the impact indicators used during the MRV process. At present, there are two streams of thought: green should refer to the envisioned solutions in 2050 while the opposing commentators suggest that green initiatives can be projects and programmes that deliver any green benefits even if these are resulting in technology lock-ins. In the case of the energy financing in the BRICS, financing a coal fired power station with CCS could be considered to be green even though it prolongs the reliance on coal. The lack of consensus on this issue has resulted in varying approaches to labelling green bonds as well as the verification required by intermediaries, underwriters and issuers.

Figure 10 – Projects financed through green bonds



Source: Climate Bonds Initiative (a), 'Green Bond Highlights 2017', https://www.climatebonds.net/files/reports/cbi-green-bonds-highlights-2017.pdf, accessed 30 April 2018.

3.6. Climate Finance in the Energy Context of the BRICS

Despite the growing push for greater focus on RE investment by the BRICS, it is likely that nuclear and coal based energy will remain within the energy mix of Member States for the short to medium-term. Therefore, clean technologies that can reduce the emissions from coal-based electricity must be explored. Clean technologies, in the context, of this research refers to a set of technologies used to reduce the emissions emitted when producing electricity from coal.

Among BRICS countries China and South Africa are in the forefront of investment in clean technologies for the use of coal. China has embarked on a massive programme of investment in such technologies in coal-fired power plants generating more than 6oo MW of power. The technologies include high efficiency combustion and advanced power generation; coal transformation; integrated gasification combined cycle (IGCC), and carbon capture storage (CCS).[32] CCS refers to technologies

[32] W.Chen, R. Xu, 2009, Clean coal technology development in China, Energy Policy 38 (2010) 2123–2130

that allow for CO2 to be captured, transport and deposited to a storage site thereby avoiding emissions into the atmosphere. The coal based power stations retrofitted with CCS is widely viewed as an inefficient and unfeasible avenue to reduce curb emissions. Despite this view by many policy actors, some studies that have been undertaken have concluded that the IGCC unit cost is higher than other technologies, and in the long term per ton reduction in emissions will be lower for IGCC with CCS technology.

CSP and CCS require higher levels of financing and state support in the form of legal and institutional instruments; long-term loan financing, and appropriate storage facilities. The financing of CCS has been compounded by Multilateral Development Banks limited their funding for these energy technologies. The BRICS New Development Bank (NDB) may be a possible option to finance energy and power generation projects with clean technologies. The NDB has already shown its intentions to finance large scale energy projects in the BRICS[33]; furthermore, its decision to use innovative climate finance instruments such as green bonds will allow the bank to scale their investments in RE technologies in the short term[34].

[33] https://mg.co.za/article/2016-04-21-brics-bank-backs-renewable-energy
[34] https://www.reuters.com/article/china-brics-bonds-idUSL4N19Y2C9

4. Conclusion

This paper has focused on the energy sector with specific interest in the aspect of RE financing. Several areas were identified where South Africa could have greater coordination and cooperation with BRICS member states. Based on the analysis undertaken, the following specific recommendations are suggested:

Blended Finance: Finance from international climate funds should be used within a blended finance framework to leverage greater private participation and investment. This could allow for energy projects to be financed while growing the private sector.

The BRICS NDB: Continued financing of energy by the BRICS New Development Bank (NDB) must continue if the BRICS are to scale up the RE portion of the energy mix. It would also be essential that the NDB support technologies that aim to reduce emissions from coal through the financing of pre-feasibility, pilots and R & D.

Green Bonds: It is essential that the BRICS NDB support green bonds by promoting capacity building to issuers on the ability of green bonds to attract new investors to the market. Furthermore, it is essential that the BRICS outline what defines green in the BRICS context as the use of proceeds will be earmarked for these project types.

Mapping of VC Complementarity: There is a need for a more extensive mapping of the complementarity of RE value chains across the BRICS. There is significant demand for RE-goods in all BRICS countries, and manufacturing capacities are being scaled up. Identifying synergies between the BRICS' efforts in this regard will enhance trading opportunities.

Intra-BRICS investment: A study on VC complementarity will also identify avenues for intra-BRICS investment in RE VCs. This will enhance the overall economic relationship between the BRICS and create a more equitable trade relationship.