

BRICS yesterday, today and tomorrow: unpacking the peculiarities going forward from South African perspective

Byelongo Elisée Isheloke^{1,2,3}

1 *Université Espoir du Congo, Baraka, Democratic Republic of the Congo* **2** *Durban University of Technology, Durban South Africa* **3** *Institut Supérieur Pédagogique-Baraka, Baraka, Democratic Republic of the Congo*

Corresponding author: Byelongo Elisée Ishelok (ebyelongo@gmail.com)

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Abstract

South Africa (SA) joined BRICS in 2010. The study explores the impact of its partnership with the BRICS group on mineral beneficiation in South Africa (SA) from its inception. The BRICS association, that had originally sought to deal with economic issues the founding members faced, became a full-fledged “umbrella organization”, which factors into its engagements a variety of issues including those of policy and polity, economy and culture and certainly the relations between the member countries.

The study culminates in designing a Mineral Beneficiation Model proposed to South Africa with the aim to enhance the cooperation between Brazil, Russia, India, China and South Africa in mining; beyond that, it addresses issues pertaining to the aftermath of the association’s metamorphosis into BRICS Plus.

In South Africa, up to 54 different minerals are extracted from its mines every day, of which a huge quantity is exported abroad to the detriment of local beneficiation entrepreneurs. The BRICS Business Council has previously identified three priorities: infrastructure development, mining beneficiation and mineral beneficiation. At that time, the mining sector contributed around 8% to the South African GDP, but there was not no agreement upon mineral beneficiation model. The involvement of BRICS partners in the extractive industry, however, required interventions to promote mining synergies. The authors sought to develop a model based on the data collected mainly through interviews and questionnaires. The study targeted 79 mining and related companies. A 30% response rate was achieved for the quantitative part of the study and 80% of participants, company representatives among them, were interviewed. The study has shown that

South Africa needs to embrace beneficiation and achieve synergy effects when working with the other BRICS Plus members.

Keywords

International trade and co-operation, mineral beneficiation, mining charter, beneficiation strategy, BRICS, BRICS Plus.

Аннотация

Южная Африка (ЮА) присоединилась к БРИКС в 2010 году. В исследовании рассматривается влияние партнерства с группой БРИКС на обогащение полезных ископаемых в Южной Африке (ЮА) с момента его создания. Объединение БРИКС, которое изначально стремилось решать экономические вопросы, стоявшие перед членами-основателями, стало полноценной «зонтичной организацией», которая учитывает в своей деятельности целый ряд вопросов, включая политику и государственное устройство, экономику и культуру и, конечно, отношения между странами-членами.

Кульминацией исследования является разработка модели обогащения полезных ископаемых, предложенной для Южной Африки с целью укрепления сотрудничества Бразилии, России, Индии, Китая и Южной Африки в горнодобывающей промышленности; кроме того, в работе рассматриваются специфические вопросы, связанные с последствиями метаморфозы ассоциации в BRICS Plus.

Ежедневно в Южной Африке из шахт добывается до 54 различных минералов, огромное количество которых экспортируется за рубеж в ущерб местным предпринимателям, занимающимся обогащением. Деловой совет БРИКС определил три приоритета: развитие инфраструктуры, обогащение горнодобывающей промышленности и обогащение полезных ископаемых. В то время доля горнодобывающего сектора в ВВП ЮАР составляла около 8 %, но не было достигнуто соглашения о модели обогащения полезных ископаемых. Однако вовлечение партнеров по БРИКС в добывающую промышленность требовало принятия мер по развитию синергии в горнодобывающей промышленности. Авторы попытались разработать модель на основе данных, собранных в основном в ходе интервью и анкетирования 79 горнодобывающих и связанных с ними компаний. В количественной части исследования был достигнут 30-процентный уровень откликов, а 80 % участников/представителей компаний были опрошены. Исследование показало, что Южной Африке необходимо проводить обогащение полезных ископаемых и добиваться синергетического эффекта при сотрудничестве с другими членами БРИКС Плюс.

Ключевые слова

Международная торговля и сотрудничество, обогащение полезных ископаемых, горнодобывающая хартия, стратегия обогащения, БРИКС, БРИКС Плюс.

JEL: F02, F13, F21.

Introduction and background

No extensive research has been done on BRICS or BRICS+ in connection with mineral beneficiation in South Africa. BRIC, a term coined by O'Neil was formed at the early

stage of the 2008-2009 world's economic crisis when the economies of the group were struggling to contain its effects (United Nations, 2015). Brazil, Russia, India, China (BRIC) invited South Africa to join the partnership in 2009 and a year later South Africa joined it on 24th December 2010 to form the BRICS. BRICS as a partnership is a relatively new concept in South Africa but Jones (2012: 1-2) states that a vast online literature is available on the BRICS financial and economic development, especially in relation to the business of global multinationals. As far as BRICS Plus is concerned, so far there have been only predictions.

Brics plus yesterday, today, and beyond

This section reviews the literature on mineral beneficiation. Discussion of the mineral beneficiation theories is of utmost importance for South Africa and countries that are rich in mineral resources.

Two theories of beneficiation fall within the ambit of this exploratory study: the economic theory of beneficiation and the political theory of beneficiation (Chatham House, 2014).

The economic theory stipulates that there are benefits from the emergence of a downstream beneficiation as it creates more jobs and encourages the use of advanced technologies. This ultimately leads to a broader economic growth for the country involved.

The political theory on beneficiation states that beneficiation is a means to prevent the exploitation of countries' resources by foreigners who may use a particular country only as a cheaper supplier of raw materials (Chatham House, 2014).

Jones, (2012) is of the opinion that, China's activities in buying up mines in the African continent should be seen as both a political and an economic move to secure its presence in Africa. This hypothesizes the hybrid theory of beneficiation. Jones argues that developed countries still need China more today than before and the BRICS countries including South Africa also do.

The government of South Africa seems to think that beneficiation is all about natural resources, and, therefore, it should only be the responsibility of the mineral department, hence the execution of beneficiation is subject to local legislation (Chatham House, 2014). Shine as cited in Chatham House, (2014) informs that, "poorly conducted beneficiation could result in value destruction". This corroborates the views of Bond, (2014a) and Chitaka et al., (2018) who are particularly cautious about downstream beneficiation, citing the complexity of implementation.

One of the beneficiation proponents is Fasheun, (2010). He points to successful beneficiation is Botswana, with its 50/50 partnership between the government and De Beers, a leading company in mining. However, there are authors who disapprove of Botswana's model of beneficiation because the company tends to influence the governance of the country and attempt to overpower the government in many ways.

The BRICS have become a force to be reckoned with, after the establishment of the New Development Bank (NDB), also known as the BRICS Bank, and its Contingency Reserve Agency (CRA). The NDB was initially funded with US\$100 billion, of which \$41 billion came from China, Russia, Brazil and India contributing US\$18 billion each, while South Africa only afforded \$5 billion. Compared to the US\$780 billion that the IMF represents, the NDB is way too little impact wise. However, it was projected that committing 16% of the BRICS Foreign Reserves that amount to US\$5 trillion would take the CRA pool to US\$800 billion (Cattaneo et al., 2015).

The NDB headquartered in Beijing has since opened an African Development Bank (ADB) that was to fund infrastructure development projects in Africa, thus providing an opportunity for what could pave the way to establishing a continental beneficiation policy. This is not in keeping with the tradition of local beneficiation as it has always been advocated by the African governments. Mineral beneficiation practices would be more beneficial to the national economy, if a holistic approach to infrastructure development were chosen (Baloyi, 2014). The weight of BRICS in the global economy had been 20% by 2018 but rose to 32% in February 2024, equaling over 27 trillion dollars or 18% of global trade. Yet, according to Cattaneo et al., (2015), with the reformed IMF, the BRICS weight might decrease.

According to Vickers, (2013), there is an economic power shift occurring in the world economy subsequent to the activities of the BRICS partnership. For example, certain countries such as Greece opted for austerity measures to deal with the economic crisis (Blyth, 2013) while others adopted the America-proven Quantitative Easing (QE) as they provided the much-needed bailout to companies in difficulty.

The BRICS Business Council has referred to mineral beneficiation as one of the priorities for the partnership engagement in South Africa; other priorities include infrastructure development and mining (Fabricius, 2013). According to Vickers, (2013), there is an economic power shift occurring in the world economy because of the BRICS. The world's economy itself has been affected by the economic crisis that saw the European Union as well as the USA economies handicapped (United Nations, 2015). The BRICS leaders noted the continuous slow pace of the normalization of the global economy as unemployment remains high and challenges such as poverty, service delivery problems and inflation persist (Fabricius, 2013:). It has been stated that: "South Africa stands to gain from its relationship with the other BRICS countries in terms of its own development and that of the region" (Notshulwana, 2012). This could also be said in relation to all BRICS Plus.

Beneficiation is a sweet and bitter story for some, but it has been there for decades if not centuries in the context of South Africa. If both downstream and upstream beneficiation plans are properly fulfilled, it could help sort out the country's developmental problems.

Downstream beneficiation involves large-scale capital-intensive activities such as smelting or refining, and labour intensive activities such as making craft jewellery and metal fabrication. Upstream beneficiation means action in support of the beneficiation practices, e.g. improving governance, fighting corruption and putting in place

administrative watchdogs to ensure that beneficiation runs as smoothly as possible. This can also involve marketing, shipping and procurement of whatever is needed for beneficiation to take place. Bailouts were given to companies as quantitative easing to support activities during the global economic crisis (Fratzscher et al., 2018).

South Africa was not in a win-win situation in the past as far as cooperation in mining with countries such as China is concerned, let alone beneficiation. The same could be said about the other BRICS member countries. Traditionally, South Africa exported raw materials which were to be beneficiated in more industrialized countries to the detriment of its domestic economy. That is why developing a sound beneficiation programme becomes a prerequisite for a new dawn in economic development.

Today, there is no standard BRICS beneficiation policy for all the partners to follow, and therefore, every member state has to take action according to existing policies within its jurisdiction. Most BRICS countries, i.e. China, Russia, and Brazil to some extent, used beneficiation to develop their economies. Why then should South Africa hesitate to expedite beneficiation programmes? The government has already put in place a new regulatory framework for beneficiation policies not long ago and beneficiation has officially become its policy. However, the implementation of this policy remains problematic. This study seeks to explore this issue and find the way out of the difficulties. The main questions to be answered are the following:

- How does the South African Mining Industry see the influence of BRICS?
- Is there any agreement upon the BRICS policy currently in use?
- What would be the impact of BRICS Plus interactions on the member countries?

These and related questions will be answered in this paper from South African BRICS Plus-related perspective.

According to the mercantilist theory, a country accumulates monetary wealth by exporting goods and services rather than by importing them (Ranzau, 2009) and mercantilists valued exports over imports (Matjie & Zamo, 2012) linking them to incremental economic growth (Thirlwall, 2016). It is during the colonial era that mercantilism blossomed as colonizing countries sought to promote trade exchanges with the colonized ones aiming to increase the amount of gold and other precious metals at their disposal. In this light, there have been cases of exploiting African countries before the independence era, if one is to consider the neo-Marxist point of view on the matter (Kabongo-Nyandu, 1997).

The absolute advantage theory explains the fact that a country may produce goods and services better than countries with whom it has the same resource availability (Eaton et al., 2009). The concept of local beneficiation is substantiated as a practice allowing countries to have an absolute advantage over others. Fasheun, (2010) advocates for local beneficiation on behalf of the government of South Africa to the annoyance of private metal and mineral companies who claim that beneficiation is counterproductive owing to the lack of capacity in the provinces. This is in agreement with Bond, (2014b), Chitaka, Blotnitz & Cohen (2018) who question the readiness of the country to embrace industrial beneficiation at large scale.

The Comparative advantage theory allows a country to trade its goods cheaper to the countries that cannot produce them for themselves because of the costs involved (Nafzinger, 2012; Ranzau, 2009). International economists use the doctrine of comparative advantage as taught by Adam Smith and David Ricardo in the 18th and early 19th century. South Africa's finance and banking institutions are cited among the best in the world (Department of mineral resources, 2011), but voices are being heard about the need to further transform or reform these institutions for effective service delivery. This includes the need for black ownership which is still very low in the banking sector. The BRICS Bank could revolutionize the banking system if the process is managed properly.

The National competitive advantage also needs explanation. (Ranzau, 2009; Ngcobo, 2012) points out that innovation and upgrading are essential activities that boost the country's competitiveness. A country that continuously innovates and upgrades its technological abilities is likely to gain a national competitive advantage over its rivals. Innovation in mining is essential to upkeep productivity and remain in the industry. Technology such as the RFID is needed for meaningful changes to take place. Mechanization of production should be conducted gradually so as not to cause domestic unrest or violent strikes. South Africa may need to prepare and plan for it before its full implementation goes forward.

Before moving on, it is necessary to explain beneficiation legal framework. There are several regulations promoting beneficiation activities and protecting the rights of those involved. These are Minerals and Petroleum Resources Development Act, Broad Based Socio-economic Charter, The Precious Metals Act, The Diamond Amendment Act, Energy Growth Plan and compliance with the Kyoto Protocol. South Africa experienced difficulties related to the compliance with some of these regulations.

Certain procedures are to be followed when, for example, passing a carbon tax into law. This will be crucial if South Africa is to do justice to international protocols and to its own citizens. South Africa's carbon tax is only a climate measure and not a revenue-mobilizing policy. The repetitive delays in its implementation are viewed negatively by some experts (McCoy, 2015). Carbon tax laws are to be enforced as they are related to other regulations applicable to the mining industry, the beneficiation included, because industrial activities tend to produce considerable carbon dioxide and thus pollute the environment.

BRICS, as an umbrella organisation, operates mainly on bilateral basis rather than on multilateralism. Although there may be agreements between countries on mining activities and beneficiation endeavours at bilateral level, no agreement upon beneficiation programmes exist at multilateral level. The present paper attempts to shed light on the way forward to resolve this issue.

Traditionally, Africa in general, and South Africa in particular, was accustomed to seeing its minerals exported abroad for beneficiation, although a small amount was processed locally. After the fall of apartheid, with the new dispensation, things have changed tremendously. Not only the government adopted a more determined

beneficiation policy compared to “traditional” beneficiation practices deemed in favour of the multinationals, it is getting the support of other countries in the Southern African Developmental Community (SADC) region. The BRICS summit in 2013 in Durban saw the participation of African Head of States from the SADC and beyond.

As projected, BRICS metamorphosed into BRICS Plus by welcoming newcomers, namely Ethiopia, Egypt, Iran, and the UAE as full-fledged member countries in the BRICS January 2024 summit in Johannesburg; the joining of the new members calls for their gradual integration. Other challenges include finance, investment and trade, ICT, a level of competition and latent conflicts between some of members making up the association, which, to some member countries may look like an unnatural one, at least to some extent (Komegan, 2024).

Table 1. A situational analysis of BRICS Plus new-members’ projections

Country	Strengths	Weaknesses/ Challenges	Opportunities	Threats
Egypt	Wealth, economic stability; ancient civilisation	Shortage of water; Israel-Palestine war	Geographic position	Regional instability including latent conflict with Ethiopia
Iran	Ancient civilisation	Regional instability	BRICS’ interactions	Israel-Palestine war; USA-UK coalition on Gaza issues
UEA	Wealth as a petrol state; tourism	Relatively small country	International trade with BRICS	To be researched
Saudi Arabia	Petrol wealth	authoritarianism	Trade with BRICS Plus	Regional instability

Source: research-based

As Table 2.1 indicates, the BRICS Plus is of recent creation and not much has been realized under that banner. It is hoped that the new member-countries will contribute to the development of the BRICS Plus international trade and socio-economic progress. Matters of political nature like BRICS stance on UNSC and Russia-Ukraine war and/or the Middle East Israel-Palestine armed conflict will also receive attention. The BRICS countries need to accommodate each other in embracing and cooperating on BRICS matters; and now even more so as BRICS Plus.

The “global value chain analysis” identifies issues that may impede the BRICS Plus progress in its future endeavors. So may South Africa’s “greenhouse gas emissions from smelters and beneficiation systems”, even though the country does not have enough electricity. Research further points to a similar situation in South Africa’s mining industry: the corporate headquarters of MNC in the West are not in favour of domestic beneficiation and this affects poor households in the country.

The current maritime transport around the region of Africa's horn and Yemen peculiar war-related development makes the situation more uncertain for BRICS Plus in the Middle East. There are problems with logistics, energy security, dollar dominated economic system, food shortages and other challenges caused by the destabilisation of the Middle East with its wars – a situation into which some BRICS Plus member countries could find themselves plunged (Komegan, 2024). Argentina, which was invited into the BRICS Plus and could have brought in a plethora of its own challenges, chose instead to forge close relations with the USA.

Companies are compelled to obey the laws of SA with regard to skills transfer, environmental protection and safe disposal of waste. More needs to be done for mineral beneficiation to prevail (Dudla, 2017); and this can be achieved when there is political will to do so (Mokati, 2017). The BRICS countries, although sharing tasks of poverty alleviation and rich versus poor income disparity, still have other country-specific problems (Mosoetsa, 2017; Khumalo, 2017). Mtshali, (2017a), Dudla (2017), and Khumalo, (2017) maintain that job creation, economic growth and improving living conditions are important objectives for their economies.

Research methodology

The research follows the exploratory design with a case study approach for data collection through questionnaires and interviews; it is predominantly qualitative with quantitative elements. The pilot study was based on the sample which did not participate in the final version of the research.

The interviews schedule had been examined by experts in the field to increase its validity. The SPSS version 24.0 was used for quantitative analysis whereas emerging themes were discussed under qualitative inputs. The paper includes a literature survey; information on BRICS Plus is obtained by empirical methods and from research literature.

Results of brics-related research in South Africa

This section presents the findings garnered using a questionnaire and interviews.

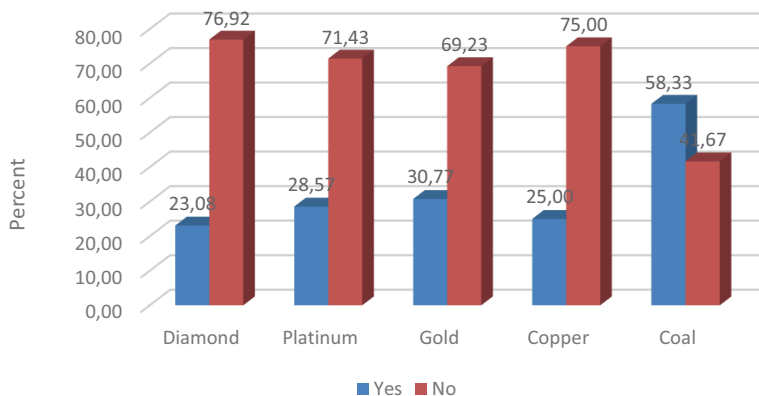
79 persons were targeted, mostly from senior, middle or lower management, with 30.4% response rate on the quantitative aspect of the study, i.e. questionnaire. As the study was predominantly qualitative, 80% of targeted interviewees agreed to participate.

Pre-testing and pilot study allowed the researchers to ensure reliability and validity of their research. It was found that the reliability scores approximate or exceed recommended Cronbach's alpha. There is, therefore, a degree of acceptance and consistent scoring for the sections in Table 1 above. The following table presents demographic and biographical findings:

Table 2. Positions held by respondents

	Frequency	Percent
Admin Controller	1	4.8
Delegated Worker	1	4.8
Director	1	4.8
Engineer	1	4.8
Finance Officer	1	4.8
General Manager	2	9.5
Legal Advisor	1	4.8
Manager	3	14.3
Manager Stakeholder Relations	1	4.8
Mine Manager	1	4.8
Mine Superintendent	1	4.8
Process Engineer	2	9.5
Project coordinator	1	4.8
Project Manager	2	9.5
Senior Process Engineer	1	4.8
Site Manager	1	4.8
Total	21	100.0

As indicated in the Table 1, senior, middle and lower management were targeted. Where necessary, a delegate had authority vested in him or her to represent the company, with 52% of the respondents employed at senior or middle management position and 14.3% of the respondents being either directors or senior leaders. The senior managers tended to be reluctant to participate in a research conducted by an outsider. 33% of the respondents were mining engineers or had a tertiary qualification. Expert opinion was taken into account.

**Figure I.** Company involvement in mining. *The company is involved in the following mining activities*

58.33% companies were involved in coal mining, while an average of 26.9% mined for other metals (See Figure 1 above). The foreign-owned mining companies were involved not only in extracting but also in trading strategic minerals such as coal and diamonds.

South Africa’s strategic minerals include coal, gold, iron ore, manganese, diamonds, platinum group metals, chrome, vanadium, titanium, nickel and uranium. The South African Mining Development Association (SAMDA, 2015) offers four additional strategic minerals: phosphate, limestone, shale gas, and oil. 23.9% of respondents represented companies involved in petroleum, fuel and oil activities. Overall, up to 53-54 different types of minerals are extracted in South Africa every day from its 1700 mines and quarries.

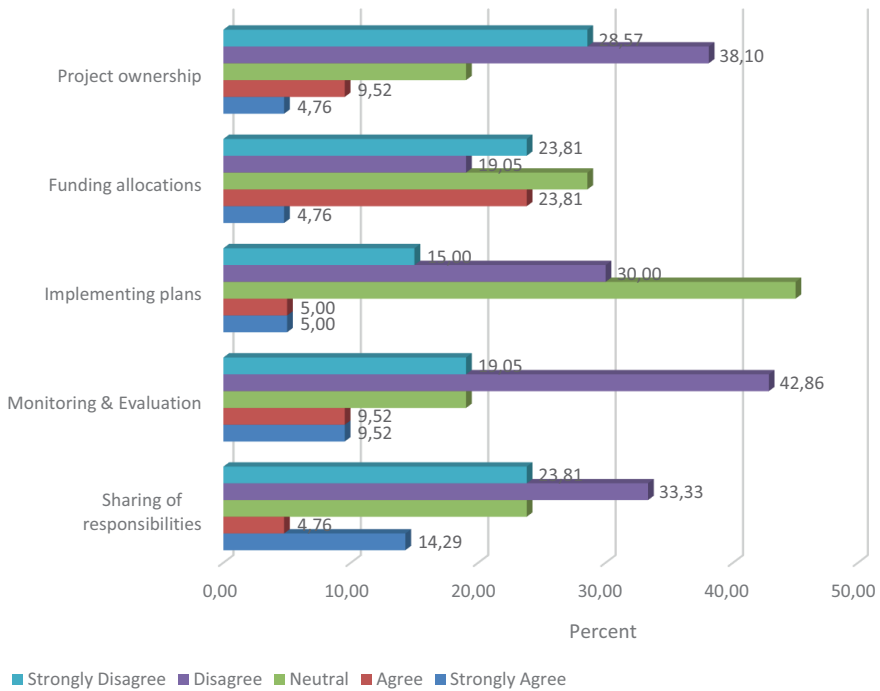


Figure 2. Companies’ managerial issues

Except for “Implementing plans” where more scores were obtained for “neutral” (45%) and for “Funding allocation” (28.6%), more respondents disagreed with the rest of the statements. Monitoring and evaluation scoring 42.86% (see above) is the key in determining how effective public participation is on livelihood status and outcomes.

Table 2 below summarises the scoring patterns; as the counts were based on multiple responses, they do not tally to 21.

Table 3. Networking capabilities of BRICS. *BRICS networking can be improved by*

	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Exchange programmes	7	33.3%	9	42.9%	4	19.0%	1	4.8%	0	0.0%
Favourable fiscal policy	4	20.0%	11	55.0%	5	25.0%	0	0.0%	0	0.0%
Financial Resources' provision	4	19.0%	13	61.9%	4	19.0%	0	0.0%	0	0.0%
Human resources' provision	6	28.6%	7	33.3%	5	23.8%	3	14.3%	0	0.0%
Utilisation of company's expertise	7	35.0%	8	40.0%	2	10.0%	2	10.0%	1	5.0%
Improved management systems	7	36.8%	5	26.3%	3	15.8%	3	15.8%	1	5.3%
Collaborative synergies	10	52.6%	6	31.6%	3	15.8%	0	0.0%	0	0.0%

Most people were positive (strongly agree and agree combined) that the BRICS networking can be improved by:

- Collaborative synergies (84.2%);
- Financial resources provision (80.9%);
- Exchange programme (76.2%);
- Utilization of companies' expertise (75%);
- Favourable fiscal policy (75%); and
- Improved management systems (63.1% (Table 4 above)).

The above is partly in corroboration with the measures taken to improve European Union. The importance of networking cannot be underestimated. This justifies the need to promote synergies as explained in the literature review (Corradi et al., 2010; Notshulwana, 2012).

Motsepe, (2023) surmises that in order to be competitive, the African economy must introduce fiscal reforms on a large scale. Collaborative synergies in mineral beneficiation could be improved by multilateral co-operation which is already taking place.

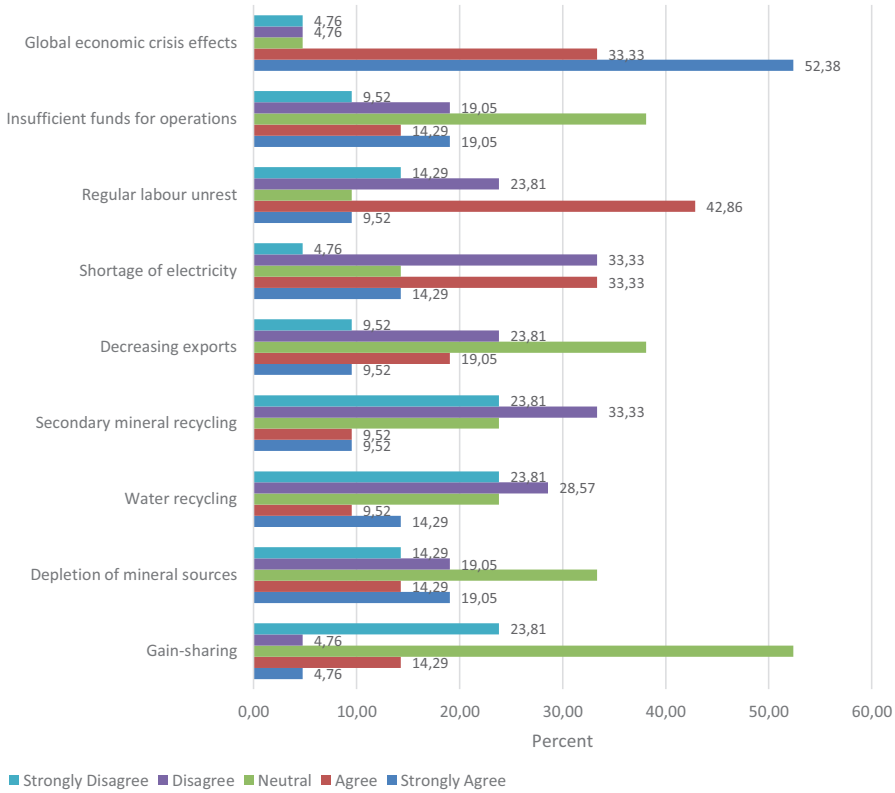


Figure 3. Implementation challenges of BRICS interventions in SA. *The company has faced the following challenges*

The bar chart above (Figure 3) illustrates the challenges. The highest scores are:

- Global economic crisis effects (52.38% strongly agree);
- Insufficient funds for operations (38.1% neutral);
- Shortage of electricity (33.33% agree or disagree);
- Decreasing exports (38.1% neutral); and
- Gain-sharing (52.4% neutral).

Challenges in the mining sector match those described in the literature (Khumalo, 2017; Khuzwayo, 2017; Venter, 2017; De Haas, 2017). Employees lost their jobs during the economic crisis, which means that the situation in the mining sector was not stable. It culminated in the violent killing of protesters at Marikana (Farlam et al., 2015). After the Marikana tragic incident that saw 44 miners killed by police in August 2012 (Venter, 2017: 2), things seem to have stabilized in SA although the issues raised were not resolved. Strikes can lead to tragedy as it also happened in Brazil (Cambero, 2017; Venter, 2017).

However, the commodity price fluctuations, inflation and tensions related to unfinished economic emancipation of the black majority and the triple challenge of unemployment (a record of 27.1% in 2017; previously it was 26.6%; currently up to 29%), poverty and income disparity threaten the stability of the country and must not therefore remain unresolved (Khumalo, 2017; Mosoetsa, 2017; Mtshali, 2017b; Reuters, 2017a). Some researchers argue that South Africa's economic problems are deepening (West, 2017); sectors like the mining industry have not fully recovered after the crisis.

The sceptics who advocate against mineral beneficiation, always explain their position by electricity shortages forgetting that alternative sources of electricity can be part of a green or renewable energy strategy and, in the long run, provide solutions to existing problems (Dudla, 2017; Mtshali, 2017a).

Table 4. Available mechanisms to overcome mining challenges in South Africa. *Mechanisms are in place to overcome the following mining challenges in SA*

	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Exhaustion of natural resources	5	25.0%	5	25.0%	5	25.0%	3	15.0%	2	10.0%
Protection of domestic markets	5	25.0%	4	20.0%	6	30.0%	4	20.0%	1	5.0%
Protection of local mining firms	6	30.0%	3	15.0%	5	25.0%	5	25.0%	1	5.0%
Reduction in domestic products consumption	3	15.0%	2	10.0%	5	25.0%	10	50.0%	0	0.0%
International disaster management protocols	3	15.0%	3	15.0%	11	55.0%	1	5.0%	2	10.0%

To the question whether mechanisms are in place to overcome the challenges, the following combined responses (agree and strongly agree) were obtained (Table 3 above):

- Exhaustion of natural resources (50%);
- Protection of domestic products (45%);

- Protection of local mining firms (45%);
- Reduction of domestic products' consumption (35%); and
- International disaster management protocol (30%).

Recycling of metals and minerals are examples of mechanisms that can help to prevent the exhaustion of some commodities. The country urgently needs mechanisms that could protect the local market from commercial "predators". It is vital that ways be found to protect the local mining firms. Of particular importance is the respect for the international treaties and protocols that help shape and reshape the socio-economic landscape affecting the mining sector (Cambero & Esposito, 2017).

Correlations

The correlation value between "In-country cutting and polishing of mineral" and "Making craft jewellery or ceramic pottery" is 0.539. This is a direct proportionality. Respondents indicate that the more cutting and polishing is done in-country, the more craft jewellery or ceramic pottery would be made. It was also found that the more "Monetary incentives" the firm gets, the higher the chances that this firm will invest in "Organizing mining skills training". The correlation is 0.766. ** The correlation is significant at 0.01 level (2-tailed) and * correlation at 0.05 level (2-tailed).

For example, the correlation value between "Local grading of mineral" and "Funding allocations" is -0.821, i.e. the more funding, the less grading takes place locally.

Qualitative data

Interviews amounted to an 80% response rate; they allowed the researchers to gather qualitative data in the form of textual information. Each interviewee was assigned a number; the order was not in sequence. This was done to hide and protect the identity of the participants in data presentation, analysis, and reporting. A content analysis of qualitative data was performed with the aim to develop new concepts in accordance with Gough, Oliver and Thomas (2017). Information was then presented thematically in the analysis section.

As one of the participants said, "there should be beneficiation of our minerals" (Interviewee no. 4) and "beneficiation is South African government's policy" (Interviewee no.5). This finding corroborates Eunomix, (2012). Mineral beneficiation is to be looked at both as downstream and upstream one because they both have a positive impact on the economy (Interviewee no.6). Mineral beneficiation must be approached gradually and responsibly (Interviewee no.5). It is important for companies operating in South Africa to follow the existing policies but the government should do more on the matter. Whereas local beneficiation has been repeatedly recommended, seldom were the instances where participants spoke about or alluded to continental beneficiation. Beneficiation is about value addition

but when not well-planned its impact on energy demand and job-creation can be devastating. This agrees with the literature (Baartjes, 2011; Department of Mineral Resources, 2011; Mungoshi, 2011).

“Beneficiation is very critical for unlocking our economic potential and is essential in our economic policies. In addition, beneficiation is critical to South Africa developmental agenda aimed at alleviating poverty and unemployment” (Interviewee no. 3).

This interviewee response matches the concept of economic theory of beneficiation (De Beers, 2014). Domestic and international trade were found to be contributing to economic gain. Africa, however, should first develop its markets at the regional level, in order to avoid uncertainty before making plans for a continental market. Another participant exclaimed: “selling raw materials without beneficiating them in our own country, it [sic] has never helped us, and it has never helped Africa” (Interviewee no. 4).

The influence of WTO is not always helping South Africa and Africa in general, especially on beneficiation practices. At times, countries are forced to export their raw materials lest they find their commodities declared unwanted or in certain instances they are summoned to international tribunal by the WTO where it is believed that a regularised open trading system is more beneficial for the economy (Reuters, 2017b).

How do you see the influence of BRICS partnership in the mining sector?

In response to this question the following statements were made by the participants:

- We don't know what the future holds for BRICS;
- Areas of co-operation for BRICS have increased over the years;
- BRICS countries are all resource economies (Interviewee no.6);
- Mining deals are not finalised among the BRICS;
- China makes investments but does not invest in procurement. And this is perceived as too bad (Interviewee no.7).

Bond, (2013) and Bond, (2014a) are generally pessimistic about BRICS, which is in agreement with the above opinions. The section below looks into the influence of BRICS on mineral beneficiation policy making.

It is generally recognized that the current beneficiation policies are not very effective in South Africa. A number of reasons could explain this, of which the major one is international and national (external and internal) interference to discourage mineral beneficiation practices (Interviewee no.5). This is consistent with what 25% of the respondents said. The view that mineral beneficiation is absolutely necessary was shared by all the respondents except one who thought it must be approached with caution.

Unlike the other BRICS countries, in SA there are very few state owned enterprises (SOEs), their total number is estimated to be around 700. As for the mining sector, the government owns only one major mining company, which, however, is not comparable to bigger companies such as Lonmin, Glencore and others in size and value (Interviewee no.5). The fact that South Africa as a mixed economy privileges the capitalist market economic system could explain, if need be, the private status of the majority of undertakings: "The government does not own a factory" (Interviewee no.5). This is consistent with Zhenbo, (2013) who surmises that South Africa is the smallest of the BRICS economies.

How can we involve the BRIC partners in promoting local mineral beneficiation in South Africa?

Prospective partners are aware of the need to weigh their strengths and weaknesses vis-à-vis their counterparts, before engaging in bi-laterals, tri-laterals, and quad-laterals (Interviewee no.5). This is in line with the SWOT-analysis performed with regard to BRICS based on Jones, (2012). The following examples depict what had happened in the past:

- A MoU Russia-SA on PGM & Palladium was signed;
- In 1977 India SA signed a MoU;
- The EU has assisted in introducing emission Euro-standards whereby cars are to be adapted to those standards; and China & SA diamonds works happen to be a reality now (Interviewee no.5).

The study has shown that there are several major challenges that South Africa should strive to meet. These:

- Global economic crisis aftermath;
- Labour unrests;
- Shortage of electricity;
- Lack of sufficient gainsharing.
- Gainsharing should be accelerated in the mining sector.

SA-BRICS beneficiation model: before BRICS plus

To create the model, we first identified the key concepts and then used insights from the literature and the results obtained in the course of research.

South Africa-BRIC Mineral Beneficiation Model

The following model was developed:

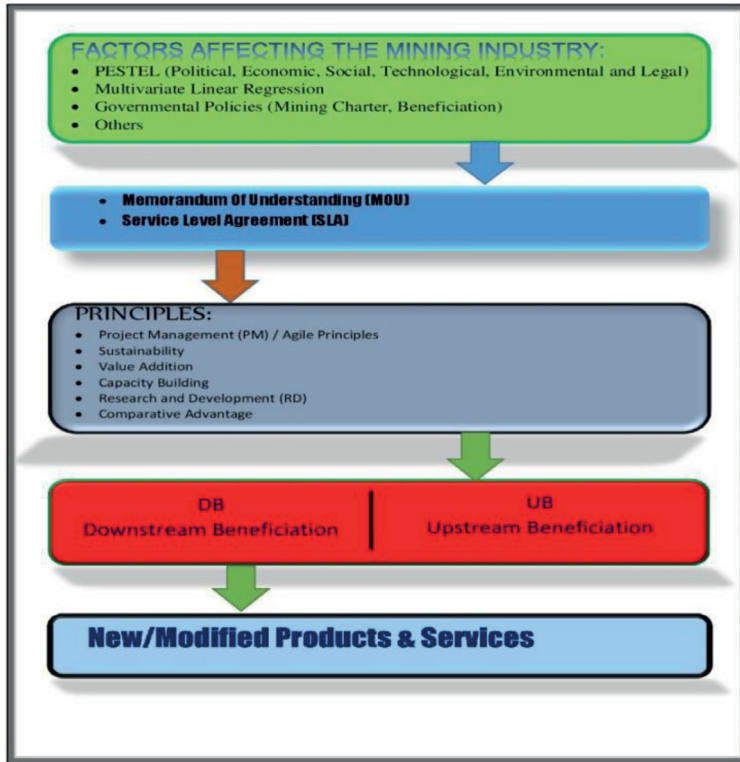


Figure 4. SABRICMB Model. *Source:* Developed by the researcher

The model addresses ways to impact the mining industry; it involves Service Level Agreements and MoU, principles applicable to the study, both downstream and upstream beneficiation aspects and ultimately highlights the need to promote new/modified services.

The model's version of BROCS integration is in agreement with the BRICS Plus model being proposed by other researchers (Huanhuan, 2017).

This model, however, does not limit the new entry to countries suggested by BRICS Plus proponents as it is in favour of an open policy, which makes it more sustainable considering the possibility that some countries may exit, and others may enter. New entry may also be viewed in terms of new members' geostrategic importance for BRICS as a transcontinental partnership. It is within this ambit that research and development are to be prioritised. The model is significant in that it presages the need for innovation through research and development.

Concerning the BRICS Plus and beyond, the model, though it is tailored to the situation in South Africa, shows that the system should undergo fundamental adaptation, change and adjustment to curtail the negative impact that the challenges to the association may have on the interactions among BRICS Plus member-countries.

Factors that impact the mining industry, MoU or Service Level Agreement and key principles

The mining industry faces many challenges. The one related to beneficiation is that there is a limited knowledge of the processing technologies, especially when it comes to rare earth minerals. On this ground, South Africa can learn from China which has been doing well for decades despite problems in its construction industry (Jordens et al., 2013). It is assumed that international protocols, such as Memorandum of Understanding (MoU) and Service Level Agreement are to be respected.

Among the principles to be adopted, business agility is seen as paramount by project management in the mining sector, which is all about managing resources that include time, equipment, systems, money and, of course, human resources provided by people.

Risk management is another aspect that project managers have to deal with. Information sharing and effective communication are equally important elements of project managers' work.

Wernham (2014) argues that agile principles can be applicable in any big organisation as they are compatible with management control mechanisms.

Unique socioeconomic situation of South Africa in the BRICS Plus

South Africa differs from the other BRICS Plus members in that it had a long period of colonisation and apartheid. The economy of a mining town evolved during the dark period of the country's history, and its impact on society and communities was devastating. As a result, South Africa is known as one of the most unequal societies in the world. It is really unique, and so any proposed model ought to be tailor-made if it is to be beneficial for the country and its people.

Downstream mineral beneficiation versus upstream mineral beneficiation

Beneficiation is efficient when both downstream and upstream mineral linkages are at play (Interviewee no.6; Figure 5). Examples of downstream beneficiation include capital intensive activities, such as smelting, refining and making craft jewellery, and labour-intensive activities like metal fabrication. Transformation of minerals creates jobs and other opportunities as minerals are upgraded and value is added for local consumption or exportation (Mungoshi, 2011). Mungoshi, (2011) and Jordens et al., (2013) recognize the benefits of beneficiation.

Klinger et al., (2007) agree with both Mungoshi, (2011) and Jordens et al., (2013) on the essence of beneficiation in that it seeks to add value by separating sand minerals,

concentrating minerals, recycling or grading minerals so that the final output can be sold at a higher price and in the process create job opportunities.

The model presented in this paper advocates for gradual and responsible mineral beneficiation activities that should proceed taking account of available infrastructure (power plants, alternative sources of energy) and adapting to the existing and evolving capabilities (Fourth industrial revolution; IT innovation). The tables that show additional findings are appended to the paper in annexures A, B, C, and D, namely cronbach's alpha (A); downstream mineral beneficiation (B); south Africa and BRICS' scores (C); and foreseeable advantages of BRICS partnership (D).

Policy recommendations

Policy measures adopted by the authorities should aim to:

- Speed up national beneficiation policy improvement; and consult for an inclusive mining charter. This could be achieved by dialogue between all the stakeholders and doing adjustments to the current policy.
- Create conducive environment for more FDI, industry and job creation rather than suffocating private initiatives by enforcing tough immigration policies; this echoes the findings by other researchers (Skinner, 2015). South Africa should continue to sensitize the population against xenophobia and improve the climate for foreign investments such as those from BRICS Plus.
- Encourage BRICS mining policy development;
- Invest in studying the successful experience in mining industry of countries such as Russia and China;
- Increase State participation in the mining sector to balance the currently prevailing reliance on private companies of foreign origin; China here sets a good example.

Conclusion

This paper explored the effects of BRICS partnership on mineral beneficiation in South Africa and projected impact of BRICS Plus. It addressed the theories relevant to the study including those on international trade and co-operation. The study found that mineral beneficiation becomes successful when both downstream and upstream beneficiation come into focus of public-private engagement, and when a "user-friendly" beneficiation infrastructure is in place. A model was developed and named SABRICMB. It is hoped that the model will contribute to promoting the idea that gradual mineral beneficiation is the way to go for South Africa and that with the advent of BRICS Plus certain adjustment will be required.

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Appendix

Annexure A: CRONBACH'S ALPHA

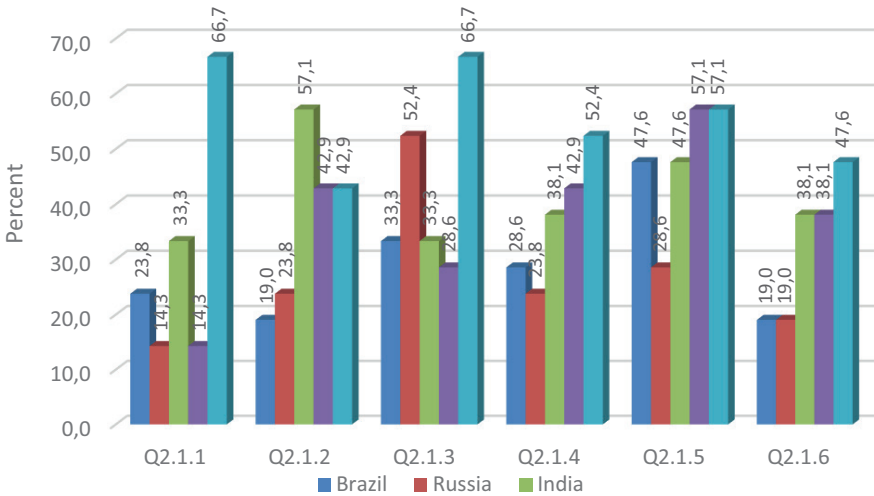
		Number of Items	Cronbach's Alpha
Q1.8	Downstream mineral beneficiation	12	0.707
Q2.2	Involved with BRICS	5	0.828
Q2.3	Project management issues	5	0.835
Q2.4	BRICS networking	7	0.740
Q3.1	Challenges Experienced	9	0.771
Q3.2	Mechanisms are in place to overcome mining challenges in SA	5	0.669
Q4.1	Advantages for the BRICS partnership	17	0.903
Q4.2	Collaboration between BRICS partners	8	0.856

Annexure B: DOWNSTREAM MINERAL BENEFICIATION

Your company addresses downstream mineral beneficiation by doing the following (Under Question 1):

	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Gainsharing	7	36.8%	1	5.3%	8	42.1%	1	5.3%	2	10.5%
Distributing monetary incentives	6	30.0%	7	35.0%	4	20.0%	2	10.0%	1	5.0%
Organising mining skills training	10	50.0%	8	40.0%	1	5.0%	0	0.0%	1	5.0%
Doing beneficiation by hydration	2	10.0%	7	35.0%	5	25.0%	4	20.0%	2	10.0%
In-country cutting and polishing of mineral	1	5.3%	3	15.8%	4	21.1%	6	31.6%	5	26.3%
Promoting better waste management	11	55.0%	5	25.0%	4	20.0%	0	0.0%	0	0.0%
Local grading of mineral	5	26.3%	4	21.1%	3	15.8%	6	31.6%	1	5.3%
Smelting locally	8	40.0%	2	10.0%	3	15.0%	4	20.0%	3	15.0%
Refining plant	5	25.0%	6	30.0%	2	10.0%	4	20.0%	3	15.0%
Making craft jewellery or ceramic pottery	1	5.0%	2	10.0%	7	35.0%	5	25.0%	5	25.0%
Investing in metal fabrication	4	21.1%	2	10.5%	2	10.5%	7	36.8%	4	21.1%
Protecting the physical environment	12	60.0%	6	30.0%	2	10.0%	0	0.0%	0	0.0%

Annexure C: SOUTH AFRICA AND BRIC SCORES



Annexure D: FORESEEABLE ADVANTAGES OF BRICS PARTNERSHIP

Rank the following foreseeable advantages for BRICS in terms of importance.

	Very Important		Important		Neutral		Not Important		Not very important	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
More sustainable operations	7	33.3%	8	38.1%	4	19.0%	2	9.5%	0	0.0%
Business expansion	7	33.3%	10	47.6%	4	19.0%	0	0.0%	0	0.0%
Expertise complementarity	5	23.8%	9	42.9%	5	23.8%	2	9.5%	0	0.0%
Increased international trade cooperation	10	47.6%	9	42.9%	1	4.8%	1	4.8%	0	0.0%
Better regional integration	5	23.8%	7	33.3%	7	33.3%	1	4.8%	1	4.8%
More profitable mineral trade	9	42.9%	8	38.1%	3	14.3%	1	4.8%	0	0.0%

	Very Important		Important		Neutral		Not Important		Not very important	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Better usage of resources	5	23.8%	8	38.1%	6	28.6%	2	9.5%	0	0.0%
Greater exchange of information	10	47.6%	6	28.6%	4	19.0%	1	4.8%	0	0.0%
Better transport infrastructures	5	23.8%	6	28.6%	7	33.3%	3	14.3%	0	0.0%
Mutual developmental dependence with BRIC	3	14.3%	6	28.6%	8	38.1%	3	14.3%	1	4.8%
Increased capital inflow	8	38.1%	6	28.6%	6	28.6%	0	0.0%	1	4.8%
Technological innovation	10	47.6%	8	38.1%	2	9.5%	1	4.8%	0	0.0%
Speedy industrialisation of new zones	7	33.3%	5	23.8%	8	38.1%	0	0.0%	1	4.8%
Price decrease	4	19.0%	4	19.0%	10	47.6%	2	9.5%	1	4.8%
Job creation	16	76.2%	1	4.8%	4	19.0%	0	0.0%	0	0.0%
Better living conditions	13	61.9%	2	9.5%	6	28.6%	0	0.0%	0	0.0%
Economic growth	15	71.4%	5	23.8%	1	4.8%	0	0.0%	0	0.0%