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## ***Procurement's perspective on the economy of South Africa and its local value added of raw materials, commodities and industry sectors***

### ***Abstract***

This working paper examines the key influencing factors of South Africa for initiating closer relationships for a procurement destination for Germany. First, the political, economic, social, and technological status is discussed to get a clear picture of the current state of South Africa's economy. In addition, external relations are analyzed, with a focus on economic relations between Germany and South Africa. After that, the focus will be on future technologies and the link to South Africa's mineral resources and value added for procurement.

This research is based on the hypothesis that South Africa will be an upcoming procurement destination for Germany in the future. The first question aims to get a look at the potentials and risks for foreign companies. The second question deals with the current relationship between South Africa and Germany and the current trend which is derived from foreign trade and foreign direct investment. The third question is answered by analyzing potential local value added in South Africa considering future technologies and their demand for mineral resources shown by different scenarios.

### **Key Words:**

resources, commodities, industry sectors, import and export relations, future technologies, sourcing options, procurement, PEST-analysis

# Procurement's perspective on the economy of South Africa and its local value added of raw materials, commodities and industry sectors

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## 1. Introduction to the Rainbow Nation South Africa

Currently, South Africa is a big topic in the news because Omicron, the Corona virus variant, was first detected in South Africa. In addition, the Corona virus has set back South Africa's economy. The GDP has been declining since the early 2020s. But South Africa is more than just a country with a Corona virus variant (Cf. Kriesch, 2021). South Africa is in many ways one of the most exciting countries in the world. Already the fact that there are eleven official languages, gives an indication of how this country gets its name Rainbow Nation. Not just because of its cultural and ethnic diversity, South Africa has established itself as one of the most popular travel destinations of Germans in recent years. Devastating natural wilderness, a great animal diversity that one comes across these are reasons for many visitors to return to this special country repeatedly.

So much colorful and fascinating beauty and the high standard of living that most visitors encounter there, quickly make forget that South Africa is a developing country that is still in the midst of a difficult transformation process. (Cf. Shin, 2021)

But is South Africa just a tourist destination or does it have potential as an upcoming procurement destination for Germany considering local value added in South Africa which could lead to further economic growth in the future?

This paper examines the key influencing factors of becoming a procurement destination for Germany. First, the political, economic, social, and technological status is discussed to get a clear picture of the current state of South Africa's economy. In addition, external relations are analyzed, with a focus on economic relations between Germany and South Africa, including foreign trade and foreign direct investment. After the discussion on the current status, the

focus will be on future technologies and the link to South Africa's mineral resources and value added for procurement.

## **2. Research Questions and Working Hypotheses**

This research is based on the hypothesis that South Africa is an upcoming procurement destination for Germany in the future. To test this hypothesis three research questions are derived:

- What are the main economic influencing factors of South Africa with special focus on external threats and export dependencies?
- What is the scope of economic relations between Germany and South Africa derived from foreign trade and foreign direct investment?
- What is the potential of mineral resources in South Africa to fulfil the raw material demand of future technologies, taking into account, that the procurement department achieves local value added for its company?

The first question aims to get a look at the current economic status, potentials, and risks for external companies. This question is to be answered with a PEST Analysis. The second question is targeted to analyze the current relationship between South Africa and Germany and the current trend which is derived from foreign trade and foreign direct investment. The third question is answered by analyzing potential local value added in South Africa considering future technologies and their demand for mineral resources.

### **3. Economic influencing factors of South Africa with special focus on export goods**

The first part of this paper deals with the factors influencing the economy of South Africa. For this purpose, a PEST analysis is conducted, considering the current and past political situation, followed by an analysis of economic indicators, such as GDP and export data. In addition, the socio-cultural environment provides an indication of whether society is a supportive factor for economic growth. The final indicator for further growth is technology and infrastructure. A summary of these four aspects shows the potential and chances for further economic growth from an internal perspective and its impact on external companies.

#### **3.1 South Africa overview and landscape**

To start some introductory words about South Africa and its landscape.

The country size is around 1,213,090 km<sup>2</sup> (2020) which is compared to Germany 3.4 times bigger. But the population is somehow surprising. South Africa is home to 59,309 million (2020) people and Germany on the other side to 83,241 million (2020). Although the area is larger, fewer people call South Africa their home (Cf. Statistisches Bundesamt (Destatis), 2021). This leads to the question what the area is used for.

A wide range of climatic zones and ecosystems favors a richness of animal and plant species that can hardly be found in this form in any other region of the world. To save biodiversity numerous national parks are established for example the most famous park, Krüger national park was established in 1898 and has a size of 19,485 km<sup>2</sup>. The park is home to many different animals especially the big five: elephant, lions, buffalo, rhinoceros, and leopards. Incredibly famous are also the penguins that can be found at Boulders Beach in Simon's Town. This is just one reason tourists have become aware of this country in recent years, although it takes about 12 hours by plane from Munich to Pretoria, the capital of South Africa. South Africa has good conditions for growing a wide range of food, beverages, and agricultural raw materials. In addition, there are numerous mineral resources that are of great importance for industrial production. (Cf. Schliephake, 2005; Cf. iportale GmbH, 2021)

#### **3.2 PEST-Analysis of South Africa**

Originally, the PEST analysis comes from strategic corporate development and is the short form of PESTEL-Analysis, which includes environmental and legal aspects into consideration.

The idea is to recognize external influencing factors, identify risks and opportunities, and derive appropriate measures. The analysis divides the factors into four categories: political factors, economic factors, socio-cultural factors and technical factors (Cf. Windolph & Blumenau, 2021).

What makes sense for entire organizations can also be applied to a country. For this paper it is used to analyse the environment around South Africa and which factors do influence economic growth and investing companies.

### **3.2.1 Historic perspective of the political situation of South Africa and current state**

The National Party, party of the Boers of Dutch descent, established the globally outlawed system of apartheid after its electoral victory in 1948, but it had already begun under the political leadership of the British-descended state leadership and lasted until shortly after the election of the moderate president Frederick Willem de Klerk. The turning point in politics in 1990 was achieved through years of protests by the black majority led by the African National Congress (ANC) and its political leader Nelson Mandela, who was also elected the country's first black president in 1994. Today, South Africa is an ethnically mixed country inhabited by people of all skin colors and is often referred to as the Rainbow Nation because of this diversity. However, because the different ethnic groups have not always lived side by side without conflict, there have been numerous ethnic problems and unrest between the country's different populations. The high crime rate is perceived as a central problem by all segments of the population. Since the end of the apartheid regime in 1994, South Africa has developed into a stable democracy. The constitution, which came into force in 1997, is one of the most progressive in the world. Among other things, it contains a comprehensive catalog of human rights. The country has a free media and an active civil society. (Cf. GFA Consulting Group GmbH, Boerger & Rogowski, 2010, p. 4-7)

Since the end of apartheid in 1994, South Africa is a parliamentary democracy with presidential and federal elements. The president is also the head of government and is elected every five years by the National Assembly. He appoints and dismisses the ministers who form his cabinet. In february 2018, president Jacob Gedleyihlekisa Zuma, who had been in power since may 2009, was ousted by the African National Congress (ANC) and was replaced by Cyril Ramaphosa, also member of ANC. The parliament consists of the National Assembly, elected by the people and the National Council of the Provinces. The latter is composed of the prime ministers of the nine provinces (Western Cape, Northern Cape,

Eastern Cape, KwaZulu-Natal, Free State, Northwest, Gauteng, Mpumalanga, Limpopo) and other delegates. (Cf. Schmidt & Hilzinger-Maas, 2021)

In July 2021 the former president Zuma got arrested due to corruption which leads to the next topic (Cf. Eligon, 2021). A well-known index is the Corruption Perception Index. South Africa is ranked as number 69 whereas Germany is ranked as number 9. The last one on the list is Somalia as number 179 (Cf. Transparency International, 2020). Therefore, South Africa still has corruption and this influences external companies.

To summarize, South Africa's Political Situation implies risks for companies currently doing business with or willing to expand to South Africa, but it has a promising foundation for further development.

### **3.2.2 Key economic figures**

With the end of apartheid, economic growth also began to pick up. Since the late 1990s, the South African economy has grown by an average of two to four percent annually. Investment increased, modern production technologies make South African products more competitive in the 1990s. Successive governments focused on consolidating government finances and macroeconomic factors. By 2008, the national debt had been reduced from 33 % to 25 %. One of the great challenges of the post-apartheid governments was to eliminate the legacies of apartheid. These reforms primarily concerned the education system, land reform and the labor market. South Africa generates about a quarter of Africa's total economic output, making it the most important economy on the continent. The country has become one of the largest investors on the African continent and Africa's economic engine. South Africa has considerable influence in the African context, for example in the South African Development Community (SADEC) and the African Union (AU). (Cf. GFA Consulting Group GmbH, Boerger & Rogowski, 2010, p. 4-7)

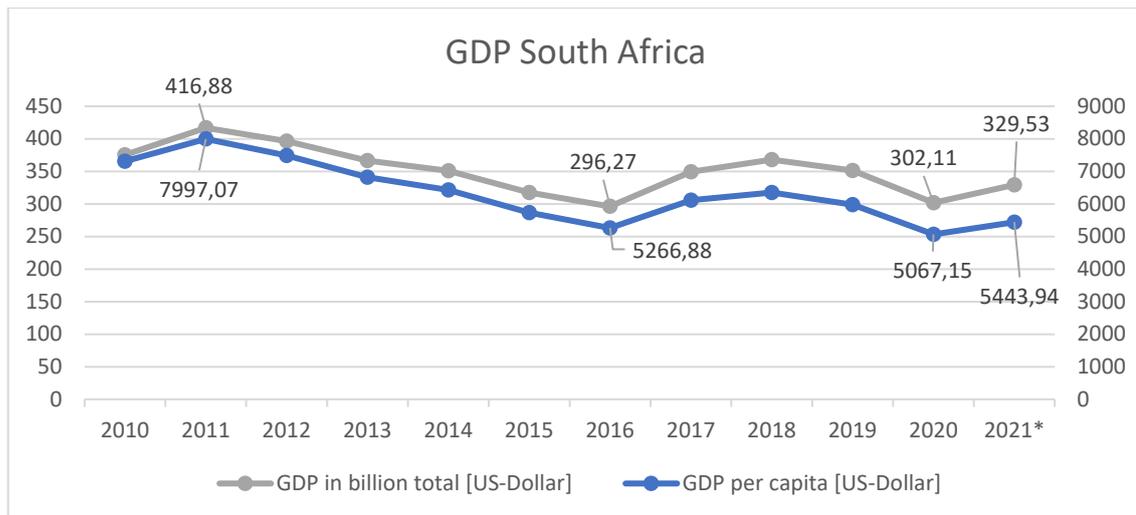


Figure 1 - GDP South Africa (Cf. Statista, 2021b)

But the actual data, shown in figure 1, does not display this specific role. In fact, the GDP declines from 2011 to 2016. Two factors are important from export point of view: First of all the slowdown in Chinese demand for commodities, which has become the leading destination for South African exports in recent years and second the ensuing decline in iron ore prices (Cf. Faure, 2017). As mentioned in the beginning the corona virus has high impact on South Africa's GDP. Covid-19 has caused widespread turbulence and volatility in South Africa since early 2020, after measures to contain the pandemic, sent shockwaves throughout the global economy. The systemic and structural challenges that South Africa's economy has been struggling with for some time, have been further exacerbated by the pandemic. The South African economy contracted in 2020 for the first time in eleven years, as measures to combat the Covid-19 pandemic hampered the economy and completely paralyzed trade and production. Structural challenges ahead of Covid-19 suggest that the recovery will be slow. Real GDP is expected to return to its pre pandemic between 2023 and 2026. (Cf. Schmidt & Hilzinger-Maas, 2021)

As a further analysis, the sectors should be considered. The dominant sectors are services with a share of 24 %, finance with around 20 % and trade with around 15 %. A closer look on the employment status leads to the same picture. services, finance and trade are the sectors with the most employees. Furthermore, one sector has to be mentioned. The mining sector earns 8.3 % of the overall GDP, but the percentage of employees is only 2.5 %. This could lead to the result that with fewer employees, a higher value can be achieved. In the fifth part of this paper the mining industry is further analyzed. (Cf. Fausi Najjar, 2020)

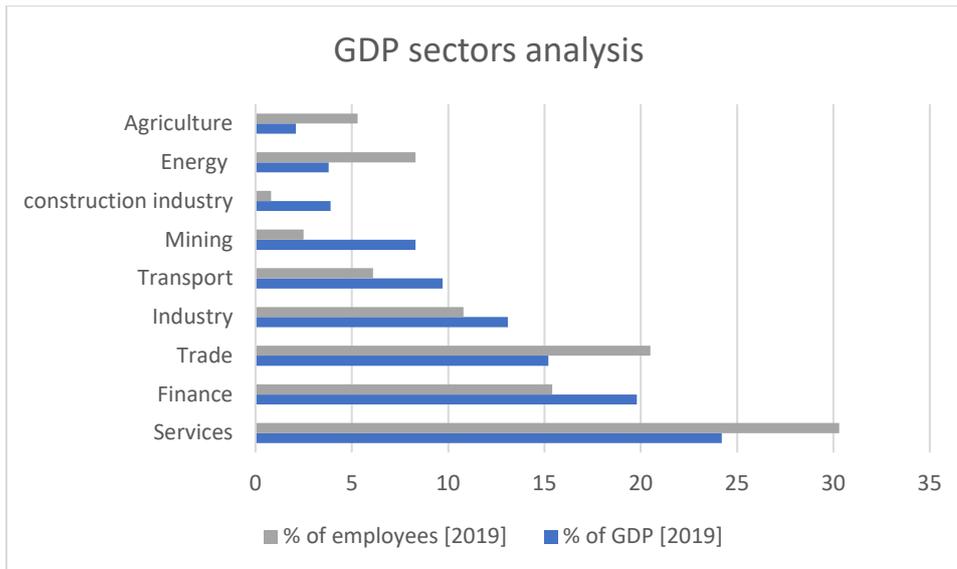


Figure 2 – GDP sectors analysis (Cf. Fausi Najjar, 2020)

The importance of the manufacturing industry has been growing steadily for years. However, due to the economic and energy crisis, growth in most subsectors slowed down over the past year, with the production of iron and steel products being particularly affected. The textile industry - an important sector of the South African economy - has been suffering from Asian competition for some time. By contrast, the construction sector is recording rapid growth. However, capacity limits are already becoming apparent here. South Africa's automobile industry has been promoted by active industrial policy and has always been considered a showcase industry (for example, the left-hand drive cars of BMW, Mercedes and Volkswagen are assembled in South Africa). However, it has suffered a severe sales crisis since 2007. Exports were less affected by this than sales on the domestic market, which fell by around five percent. (Cf. GFA Consulting Group GmbH, Boerger & Rogowski, 2010, p. 4-7)

As the focus of this working paper is export relations the next key economic figure are the exports of South Africa. As just seen, the GDP is decreasing from 2011 until 2016 and the same happens to the exports. Since then, the numbers rise until 2018 and decline in 2019 and with the pandemic to a new minimum in 2020, to be seen in figure 3.

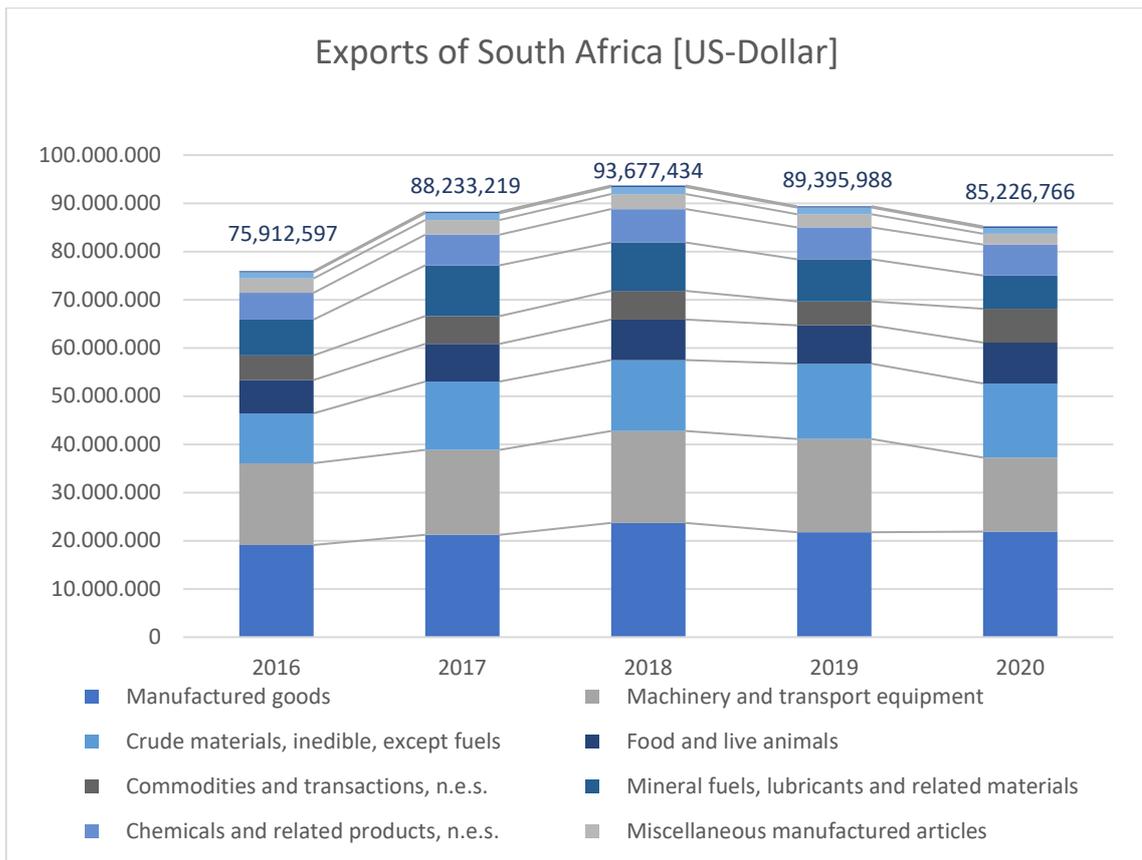


Figure 3 - Exports of South Africa (Own illustration based on United Nations, 2021)

The most important product category for South African export, explained in figure 4, is metals with 18 % and machines with 17 %. The key finding here is that it is a different picture than the sectors mentioned in the GDP context. Whereas services and finance are the most important sectors in the GDP, the most important sectors in the export context are metals and machines. (Cf. United Nations, 2021)

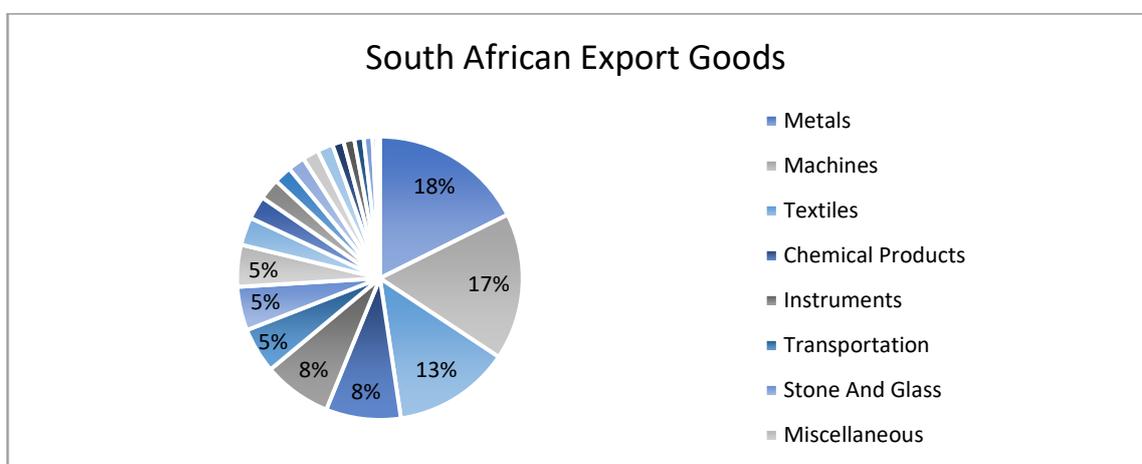


Figure 4 - South African Export Goods (Own illustration based on United Nations, 2021)

The most important export destination is China with a share of 13.4 %. And this indicates the reason why it is possible that China makes a difference in the GDP of South Africa as seen in the beginning. (Cf. Arnoldi, 2020)

The last economic key figure is the exchange rate, which answers the question: How many euros do you get for one South African Rand? As shown in figure 5, since early of the 2017 the exchange rate is increasing which means that you will get more South African Rand for 1 Euro and the other way round you will get less Rand for Euros.

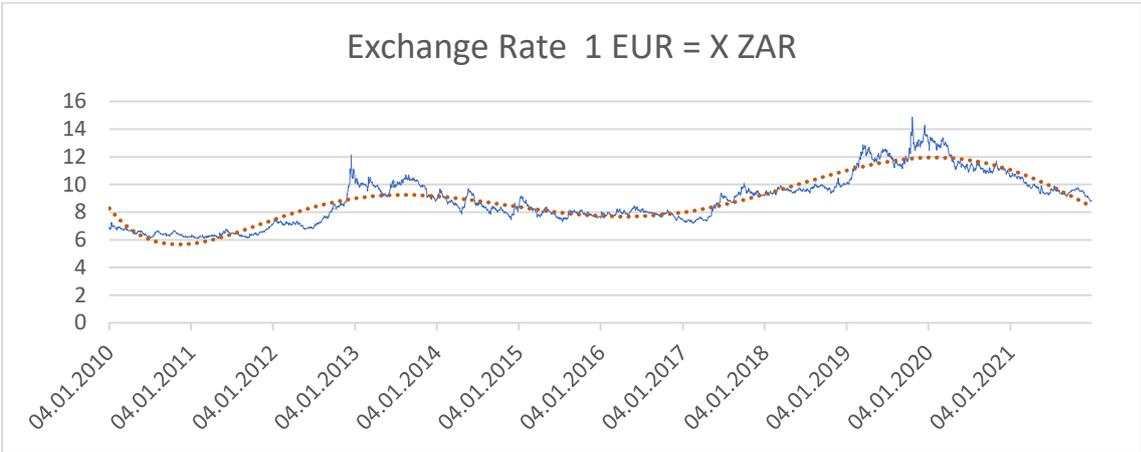


Figure 5 - Exchange Rate (Cf. European Central Bank, 2021)

So, if someone buys a product of South Africa it will get cheaper since you will get more Rand and value for Euros. If this trend continues companies are likely to buy more products from South Africa since the products gets cheaper for companies from outside South Africa for example Europe. This fact supports exports and averts imports.

### 3.2.3 Social and cultural environment

The next aspect is dealing with the social and cultural environment. This gives an indication of how well developed the population is and whether the population supports economic growth. As mentioned in the beginning the country is called rainbow nation and this reflects the ethnicities distribution which is shown in figure 6. 81 % are Black African, and the other groups sums up to 19 %. At the end of apartheid, a policy is created to redress economic imbalances among historically disadvantaged communities. This policy is called Broad-Based Black Economic Empowerment (B-BBEE). Still until today there are massive problems between the different ethnicity groups due to these historical reasons (Cf. International Trade Administration, 2021b; Cf. Central Intelligence Agency, 2018).

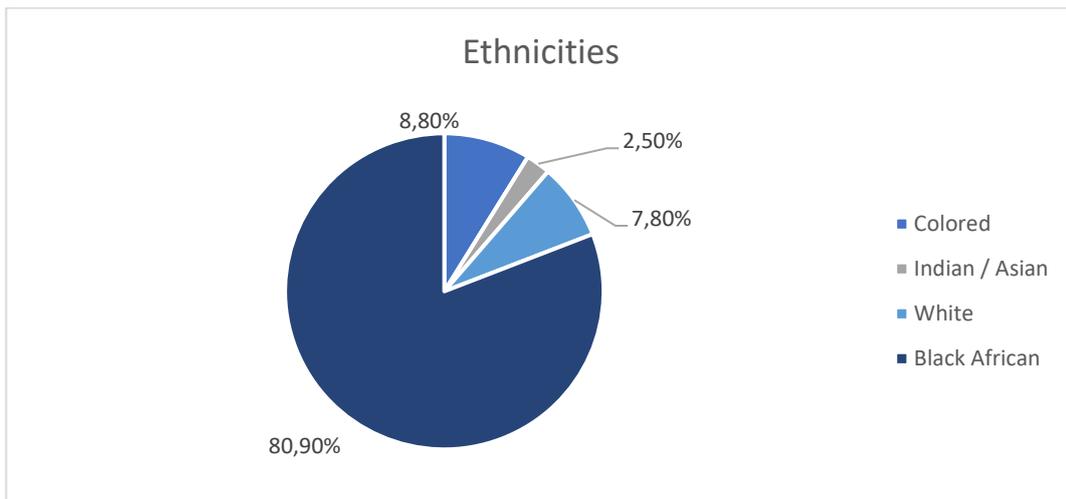


Figure 6 - Ethnicities Distribution in South Africa (Cf. Central Intelligence Agency, 2018)

As a next key indicator, the youth not in employment, education or training is described in figure 7. While on average only 6.8 % are not in employment, education, or training, in South Africa the figure is 12.8 %, about twice the global average (Cf. OECD, 2020).

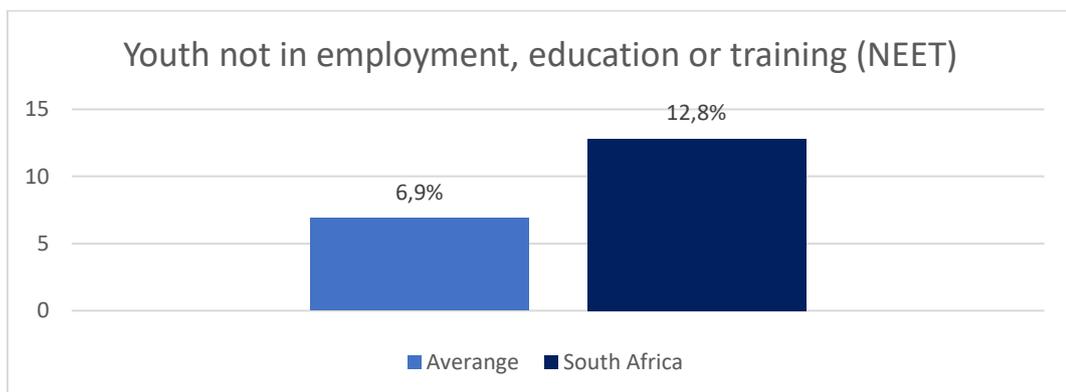


Figure 7 - Youth not in employment, education or training (Cf. OECD, 2020)

This leads to the next point, because of this figure it can be assumed that skilled labor is hard to find in South Africa even though the unemployment rate is increasing continuously. In literature it is sometimes described as “[...] poor state of the public education system [...]” (International Trade Administration, 2021b). Prior to Covid-19, the unemployment rate was about 29 %, and if you include those who have given up looking for a job, the number is 37 %. For companies which want to expand to South Africa this should be taken into consideration. (Cf. International Trade Administration, 2021b)

While the fact that it is difficult to find qualified workers is unattractive for companies, the average income in the spending workforce in South Africa is only around R23,133 per month,

which corresponds to about 1,330 €. Compared to Germany, where the average income is 3,975 € this is very low and can be considered attractive for companies. (Cf. Rehbock, 2021; Cf. Writer, 2021)

While talking about income, it has to be said that 10 % of the population earns 45 % of the national income, which correspond to a Gini coefficient of 0.61. This indicates great inequality in the population. (Cf. International Trade Administration, 2021c)

### 3.2.4 Infrastructure and technology

This part of the PEST-Analysis deals with the infrastructure and the accessible technology of South Africa.

Table 1 - Infrastructure South Africa compared to Africa in total (Cf. Eglitis, 2021)

	South Africa			Africa	
	total	per 1 Mil Inhabitants		total	per 1 Mil Inhabitants
<b>Street</b>	750,000 km	12,645.70 km	<b>~25%</b>	3,002.100 km	2,239.71 km
<b>Train</b>	21,000 km	353.84 km	<b>~24%</b>	89,000 km	66.41 km
<b>Ship</b>	103	1.74	<b>~1.4%</b>	7,482	5.58
<b>Airport</b>	407	6.86	<b>~13%</b>	3,158	2.36

In table 1 a comparison is made between South Africa and Africa as a continent. South Africa plays a prominent role when it comes to infrastructure, as it is home to around 25 % of total road kilometers and 24 % of train kilometers and 13 % of all airports of Africa are located in South Africa. (Cf. Eglitis, 2021)

This fact makes it clearer, why South Africa is often called the door or gateway to the African Market (Cf. Scholvin & Draper, 2012).

On top of that roughly 68.2 people out of 100 are internet users (Cf. Statistisches Bundesamt, 2019). Compared to the other countries in Africa this makes South Africa stands out and is a supporting factor for economic growth.

Besides the internet users South Africa is a big market for the information and communication sector. Recently some big IT companies invested in South Africa for example IBM, Dell, Microsoft. These companies use South Africa as the gateway for the fast-growing African market and supply base. Subsidiaries and South African companies supply a big amount of new fixed and wireless telecoms networks. This fact can be seen as a great potential for the South African economy in the next years. (Cf. International Trade Administration, 2021 a)

### 3.3 Recap and results

South Africa remains divided: On the one hand, the country is an advanced economy with a world-class financial sector, immense reserves of raw materials, a good infrastructure compared to the rest of Africa, a progressive constitution, and great economic opportunities. On the other hand, it is still a developing country characterized by social inequality and high unemployment. Since the first free elections in 1994, the governments' economic and industrial policies have had to cope with these two sides and with post-apartheid problems, which remain a major challenge. Covid-19 has caused great turbulence and volatility in South Africa since the beginning of 2020, after measures to contain the pandemic sent shock waves through the global economy. As a procurement destination it has positive aspects for example the infrastructure, exchange rate and democracy as well as some risky factors for example social inequality, violence and crime. (Cf. Schmidt & Hilzinger-Maas, 2021)

## 4. Business relations between South Africa and Germany

As an introduction, this chapter sets total trade values for Germany and South Africa in a global context. In order to assess the importance of trade relations between Germany and South Africa, this chapter first considers some data illustrating South Africa as a gateway to the African market for Germany. The next section takes a more detailed look at trade relations in recent years. Here, the value-based trade activities at commodity group level are presented. The most valuable groups are highlighted, and some selected trends are displayed. Finally, in order to get an overview of the business relations between German and South African companies, the foreign direct investments in the respective countries and some company key figures are presented.

### 4.1 South Africa as key to Africa for German companies

An economic relationship with South Africa is often promoted with theses like “South Africa as Africa's Gateway” (South African Institute of International Affairs, 2012) or “South Africa is Germany's most important partner in sub-Saharan Africa” (Auswärtiges Amt, 2019). These and comparable statements suggest an important business relationship between German and South African companies. In this section this business relationship between these two states is introduced and certain dependencies are shown.

#### 4.1.1 Comparison Germany and South Africa in a global context

According to the United Nations, over 19,037 billion USD worth of goods were traded globally as imports in 2019. German imports of commodities are worth approximately 1,164 billion USD in the same period. This represents a share of roughly 6 % of the worldwide registered imports. In comparison, global imports registered to South Africa are 69 billion USD. This represents slightly less than 0.4 % of registered imports worldwide. The picture is the same for registered exports. A total of 18,815 billion USD is reported globally across all product groups in the United Nations database for 2019. This compares to 1,379 billion USD for German (7 %) and 85 billion USD for South African exports (0.5 %). (Cf. United Nations, 2021)

In global terms, South Africa thus plays in terms of value a much smaller role in world trade than Germany.

#### 4.1.2 Dependencies regarding trade and investments

This minor significance is not the case when comparing the flow of goods between the entire African continent, South Africa, and Germany. The respective comparisons with import and export values from 2020 can be obtained in figure 8 and figure 9.

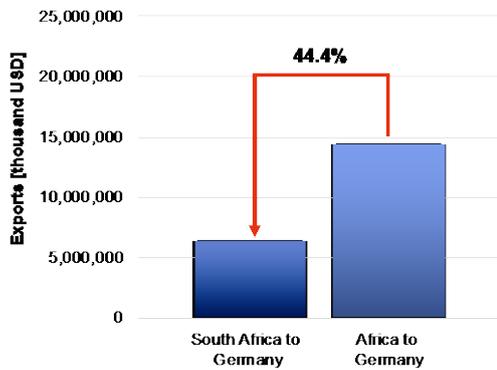


Figure 8 - Comparison of exports South Africa or the African continent to Germany in 2020 (Own illustration based on United Nations, 2021)

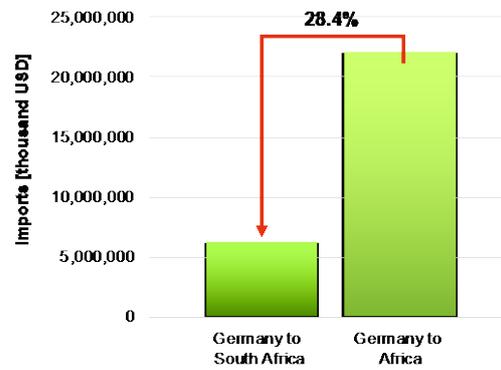


Figure 9 - Comparison of imports from Germany to South Africa or the African continent in 2020 (Own illustration based on United Nations, 2021)

On the left side above, the comparison of exports from South Africa to Germany and exports from the entire African continent to Germany are shown (figure 8). This chart indicates that South African exports account for more than 44 % of total exports from Africa to Germany. The same on the right side, only in reverse order (figure 9). Comparing imports from Germany to South Africa with imports from Germany to the entire African continent, it can be noticed that South Africa is responsible for over 28 % of all imports to the entire African continent by value. In terms of value, South Africa is therefore one of Germany's most important trading partners on the African continent.

Figure 10 below further illustrates the importance of business relations between South Africa and Germany for the African continent. This chart shows the top ten German direct investment stocks in African countries by value for 2019.

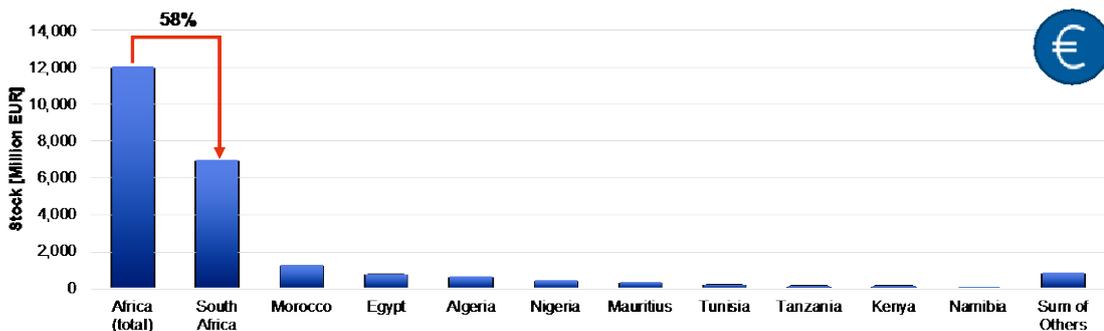


Figure 10 - Stock of German direct investment in African countries (Cf. GTAI, 2021 a)

South Africa has a special status and is ranked first. This country represents about 58 % of all investments that are placed in Africa by German foreign direct investments. This high level of investment stock shows that South Africa is the most attractive location in Africa for investments out of Germany and underlines the importance of economic relations between these two countries.

Lastly, the value-based trade relations between Germany and South Africa in 2020 are presented. From a German perspective in figure 11 and from a South African perspective in figure 12. In these two charts, the imports respectively the exports between the two countries are set in relation to the total imports and exports of each country.

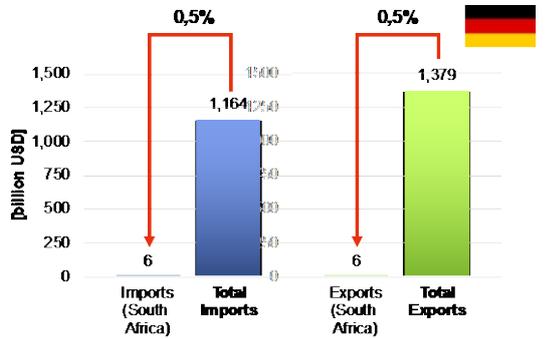


Figure 11 - Foreign Trade with South Africa from a German perspective in 2020 (Own illustration based on United Nations, 2021)

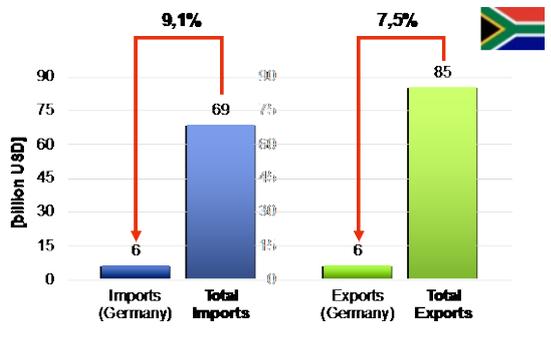


Figure 12 - Foreign Trade with Germany from a South African perspective in 2020 (Own illustration based on United Nations, 2021)

On the left side, can be seen that South African imports and exports have a low influence on the total trade mass of Germany. Both shares are below 1 %. But on the right side, the South Africa perspective, imports, or exports with trading partner Germany account for a significant share compared to the total imports or exports of South Africa. Imports from Germany to South Africa account for over 9 % of total imports. Same for the exports. Here, exports account for more than 7 % of total exports.

This large share of South Africa's total trade volume in value terms indicates that Germany is an important trading partner for South Africa. In addition, figure 10 shows that the German stock of foreign direct investment in South Africa is the highest on the African continent. The theme of this chapter is underlined by these two facts: Which business relationships exist between Germany and South Africa? Which industries respectively commodity groups are affected?

## 4.2 Consideration of foreign trade relations between Germany and South Africa

To assess exactly what the trade relationships shown in figure 12 look like, this section dives deeper into this situation and illustrates the flow of goods at commodity group level in recent years. But before this deep dive, the definition of important commodity groups for the trade relation between Germany and South Africa are described first.

### 4.2.1 Overview to the Standard international trade classification

In principle, all values of this section are based on data which is obtained from the United Nations database. This database divides all values according to SITC. The abbreviation SITC stands for "Standard international trade classification" (United Nations, 2006). With this categorization a comparison of commodities and manufactured goods on an international basis is possible (Cf. Eurostat, 2013).

This classification is divided into five levels with different numbers of subsections. On the top level there are 10 sections in total, but not all of them are of great importance for this work. Because of this fact not all sections are described in detail. (Cf. United Nations, 2006)

Only selected top levels with special importance for the business relationship between Germany and South Africa are defined in the next section.

### 4.2.2 Definitions of commodity groups with special significance

As shown in the detailed analysis of trade flows in the next two sections, five commodity groups dominate in terms of value the overall flow of goods between Germany and South Africa. To understand these top commodity groups, the underlying products are now presented first. The top commodity groups are the following SITC sections:

Nr. 2: Crude materials: Goods such as *cork and wood, pulp and waste paper* and *metalliferous ores and metal scrap* are classified in this group (Cf. United Nations, 2006). In the case of the trade relationship considered here, these are primarily mining raw products. These are classified in the group *metalliferous ores and metal scrap*. Some examples are *ores and concentrates of precious metals* or *iron ore and concentrates*. (Cf. United Nations, 2021)

Nr. 5: Chemicals and related products, n.e.s.: According to SITC, products like *organic chemicals, medicinal and pharmaceutical products* and *chemical materials and products* are classified in this section (Cf. United Nations, 2006). In the flow of goods between South Africa

and Germany affecting this section, the two largest product groups are *medicaments* and *miscellaneous chemical products* (Cf. United Nations, 2021).

Nr. 6 – Manufactured goods: Example product groups are *rubber manufactures, iron and steel* and *non-ferrous metals* (Cf. United Nations, 2006). For South African exports to Germany, a large share is accounted by the group *non-ferrous metals*. These are mainly unwrought, unworked or semi-manufactured platinum and other metals of the platinum group. (Cf. United Nations, 2021)

Nr. 7 – Machinery and transport equipment: Examples from this section are *power-generating machinery and equipment, telecommunications and sound-recording and reproducing apparatus and equipment* and *road vehicles* (Cf. United Nations, 2006). Products from the automotive industry, whether individual assemblies or entire vehicles, account for the largest share of merchandise trade between South Africa and Germany in this section (Cf. United Nations, 2021).

Nr. 9 - Commodities and transactions, n.e.s: In the last section, products like *coins (other than gold coin)* and *non-monetary gold (excluding gold, ores, and concentrates)* can be found. And in addition, there is a group that contains all unclassified goods. (Cf. United Nations, 2006) When observing the values for South African imports from Germany, this group of unclassified products accounts for the largest share of this section (Cf. United Nations, 2021).

#### **4.2.3 Total trade flows between Germany and South Africa**

The first direction shown in this section is the trade flow from Germany to South Africa. These imports are shown in figure 13 for the years from 2016 to 2020.

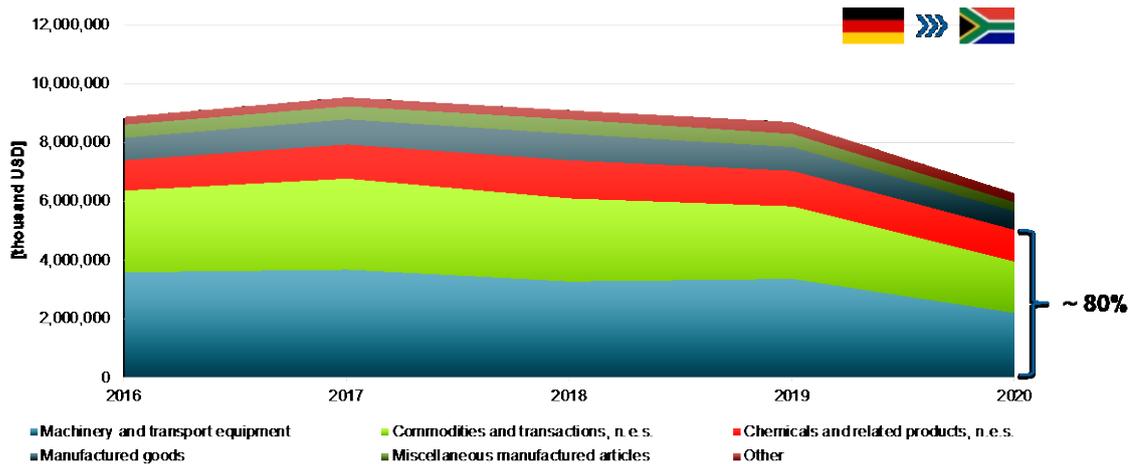


Figure 13 - South African imports from Germany by commodity group in the years 2016 to 2020 (Own illustration based on United Nations, 2021)

More than 80 % of all imports are accounted by the SITC sections *machinery and transport equipment*, *commodities and transactions* and *chemicals and related products*. For the largest group, *machinery and transport equipment*, are the main products by value in 2020 (Cf. United Nations, 2021):

1. *Motor vehicles for the transport of persons* with about 450 million USD
2. *Parts & accessories of vehicles* with about 270 million USD

The strong presence of automotive industry is therefore recognizable. For the second largest group, *commodities and transactions*, the database shows a large undefined share (Cf. United Nations, 2021). Due to this insufficient data quality, this group cannot be considered for further evaluation. At least, the third largest group, *chemicals and related products*, are mainly driven by (Cf. United Nations, 2021):

1. *Medicaments* with about 200 million USD
2. *Medicinal and pharmaceutical products* with about 75 million USD

Next, the reverse direction is shown in figure 14. This chart shows the total value of merchandise trade flowing from South Africa to Germany from 2016 to 2020.

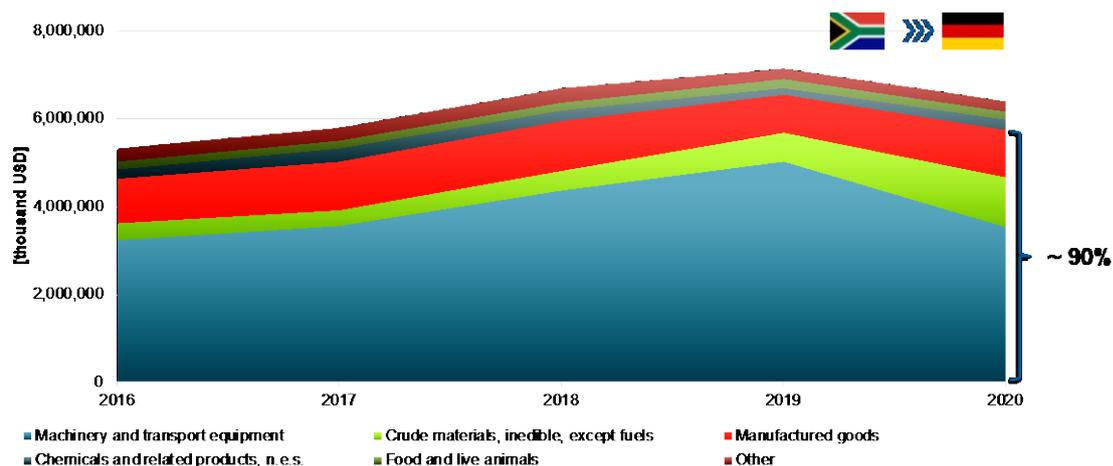


Figure 14 - South African exports to Germany by commodity group in the years 2016 to 2020 (Own illustration based on United Nations, 2021)

More than 90 % of South Africa's exports to Germany in 2020 are divided into three groups: *machinery and transport equipment*, *crude materials*, and *manufactured goods*. In the exports the largest group is again the *machinery and transport equipment* commodity group with about 55 % of all exports. The three product groups with largest contribution to the total value of this SITC section in 2020 are (Cf. United Nations, 2021):

1. *Motor vehicles for the transport of persons* with 2,387 million USD
2. *Pumps (excluding liquid), gas compressors & fans* (~504 million USD)
3. *Motor vehicle for transport of goods* (~339 million USD)

On second the commodity group *crude materials* with approximately 18 % of all exports is ranked. The largest two product groups by value within this group are (Cf. United Nations, 2021):

1. *Ores & concentrates of precious metals* with about 912 million USD
2. *Iron ore and concentrates* with approximately 189 million USD

And on the third rank the commodity group *manufactured goods* with about 16 % of all exports is placed. More than 80 % of the value of this group is accounted by the products of the class *silver, platinum, other metals of the platinum group* (approximately 871 million USD). All other product groups within this section show values smaller than 40 million USD and are all smaller than 4 % of total exports from group *manufactured goods*. (Cf. United Nations, 2021)

#### 4.2.4 Focus on trends in trade flows of main commodity groups

The figures below show the largest product group by value from each of the three largest export groups shown in figure 14. These are vehicles for passenger transportation (figure 15), ores of precious metals (figure 16) and semi-finished products which are mainly based on platinum (figure 17).

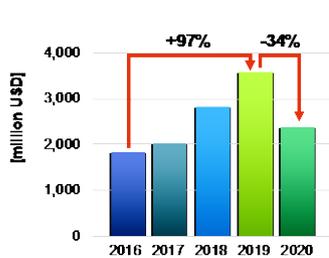


Figure 15 - Value-based development of motor vehicle exports from South Africa to Germany from 2016 to 2020 (Own illustration based on United Nations, 2021)

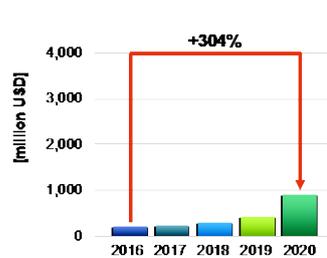


Figure 16 - Value-based development of ores of precious metals exports from South Africa to Germany from 2016 to 2020 (Own illustration based on United Nations, 2021)

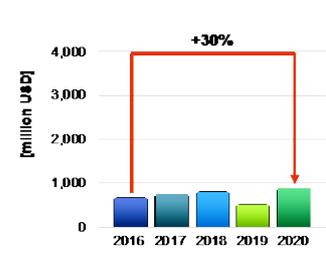


Figure 17 - Value-based development of silver, platinum, other metals of the platinum group export from South Africa to Germany from 2016 to 2020 (Own illustration based on United Nations, 2021)

Vehicles for passenger transport is the most exported product from South Africa to Germany in terms of value. The share of exported vehicles has risen sharply between the years 2016 to 2019 (+97 %) but dropped in 2020 (-34 %) (Cf. United Nations, 2021). This decline is probably due to the Corona crisis last year.

However, the trend in the export of mining products shows an upward trend throughout the last years from 2016 to 2020, despite the Corona crisis in 2020. The near doubling of exports of precious metal ores over the period shown underscores the significant increase in exports (Cf. United Nations, 2021). As already described in the chapter 3 *Economic influencing factors of South Africa with special focus on export goods*, the export of mineral resources is an important pillar in the exports of South Africa. This can also be seen in the relationship with Germany and the trend points to further growth. More details to this topic will also be shown in the chapter 5 *Analysis of mineral resources and value added for procurement purposes from South Africa*.

A similar situation can be observed in the product group *silver, platinum and other metals of the platinum group*. The trend in exports in recent years shows a steady increase. For the period from 2016 to 2020, exports increased by approximately 30 % (Cf. United Nations, 2021). This product group is part of section *manufactured goods*. As described, this group

includes unwrought, unworked or semi-manufactured metals. Thus, not only raw materials are exported from South Africa to Germany, but also mining goods with a certain share of value added in South Africa.

#### 4.2.5 Recap of results in trade flows between Germany and South Africa

In summary, Germany is important as a trading partner for South Africa. This is the case for imports as well as for exports. While imports from Germany to South Africa have decreased since 2017 (see figure 13), exports to Germany have increased until 2019 (as shown in figure 14). Only in 2020 was a significant drop in exports. This is mainly due to the decline in exports in the passenger car sector, which nevertheless accounts for the largest share of exports by value in 2020. However, individual product groups around mining products show an increase, which shows that there is still potential and an intact trade relationship.

### 4.3 Analysis of foreign direct investments made between Germany and South Africa

Using data from the *Deutsche Bundesbank*, business relations between Germany and South Africa are analyzed in this section with the help of foreign direct investments (FDI). For this purpose, FDI will be defined first. Then, the FDI transactions between South Africa, the world and Germany is compared. On the level of companies, some key figures are presented and finally an example of a German FDI in South Africa is shown.

#### 4.3.1 Difference between foreign direct investment transaction and stock

The *Deutsche Bundesbank* defined foreign direct investment as follows: "Foreign direct investment (FDI) is defined as cross-border investment in enterprises with the objective of establishing a lasting influence over business activities." (Deutsche Bundesbank, 2021b) According to the World Bank definition, the necessary level of influence is reached when a company owns at least 10 percent of all voting shares in another company. (Cf. The World Bank Group, 2022)

The database of the *Deutsche Bundesbank* is one basis for the following statistics. This institution classifies FDIs into two categories:

1. Transaction values of direct investments are the actual value flow between companies of two countries, measured over total receivables and liabilities (Asset-Liability-Principle). (Cf. Deutsche Bundesbank, 2019)

2. Foreign direct investment stock – This is the stock of investments already made in the relevant target country. These are either estimated via current transaction reports from the balance of payments (if current stock data are not available due to time constraints), or determined by collected stock data. (Cf. Deutsche Bundesbank, 2019)

#### 4.3.2 Foreign direct investment inflow to South Africa

Figure 18 below shows the transaction values of foreign direct investments inflow to South Africa over the period from 2009 to 2019. Shown are, on the one hand, the total transactions to South Africa (blue line) and, on the other hand, those flowing from Germany to South Africa (green line).

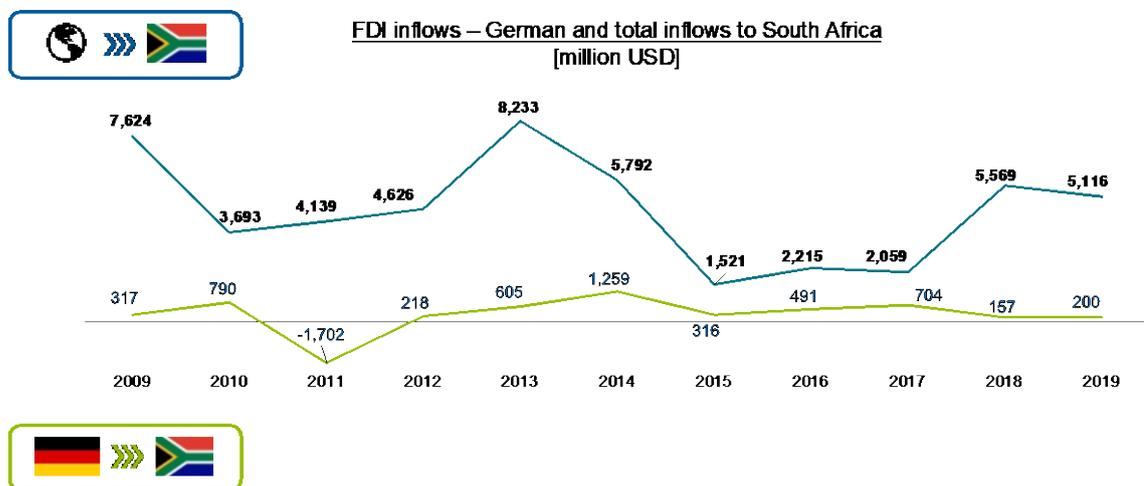


Figure 18 - Comparison of Total FDI inflows with the share of German FDI inflows to South Africa (2009-2019)  
(Own illustration based on Deutsche Bundesbank, 2021a; World Bank, 2021a)

While total FDI in South Africa has fluctuated strongly in recent years, German FDI has remained at a constant level in absolute terms since 2012 (Cf. Deutsche Bundesbank, 2021a; Cf. World Bank, 2021a). From this can be deduced the long-first and constant cooperation of German companies in South Africa.

#### 4.3.3 Foreign direct investment outflow from South Africa

Similar can be observed by looking at the outflows (figure 19). Again, the blue line shows total outflows, and the green line shows German outflows.



**FDI outflows – German and total outflows from South Africa**  
[million USD]



Figure 19 - Comparison of Total FDI outflows with the share of German FDI outflows from South Africa (2009-2019) (Own illustration based on Deutsche Bundesbank, 2021a; World Bank, 2021b)

FDI outflows from South Africa to Germany remains at a constant level since 2009. Some outflows of the shown years are even negative. This is because losses are also included in the transaction values. If losses were generated and these were not offset by enough new investments, the outflow becomes negative. Total FDI outflows from South Africa have surged from 2011 to 2014 and remained at a higher level. However, the same cannot be observed for South African outflows to Germany. (Cf. Deutsche Bundesbank, 2021a; Cf. World Bank, 2021b)

These constant outflows also show that there is a stable business relationship, but at a lower level compared to the inflows.

#### 4.3.4 Foreign direct investment stocks in connection with corporate key figures

Some of the corporate key performance indicators are presented in this section. As shown before, there is no major change in FDI transactions between German and South African companies. Because of that, the stock of German FDI has remained constant over the years from 2010 to 2019, too. This stock averaged around 6,100 million euros during this period. This is also reflected in the number of German companies operating in South Africa and the number of employees working there. Both key figures remain relatively constant. Thus, in the time horizon from 2010 to 2019, on average 409 companies are located, employing on average 70 thousand workers. However, an increase in sales revenue of German companies operating in South Africa can be seen. So, the annual revenue of the resident companies amounted to 17,726 million euros in 2013. This increased by nearly 33 % to 23,574 million euros. This shows that higher sales can be achieved under the similar conditions. Due to that a

certain success for German companies could be recorded. (Cf. Deutsche Bundesbank, 2021a)

A different picture emerges when looking at South African companies operating in Germany. In 2013, a decline in the stock of FDI and the number of companies was observed among South African companies in Germany. However, in 2018 an increase can be recognized again. Here, all three key figures increase again. For example, the investment stock of South African companies in Germany rises from -109 million euros in 2017 to 929 million euros in 2019. At the same time, the number of resident companies increases from 8 to 9 and the number of employees from 2 to 3 thousand. This shows that South African companies have again invested in Germany during this period. (Cf. Deutsche Bundesbank, 2021 a)

#### **4.3.5 Interpretation of the business relationships under consideration of FDI**

All in all, an active and long-term economic relationship is established between German and South African companies. This is characterized by the constant foreign direct investment figures over the time horizon of 2009 to 2019 presented in the previous sections. But these are at a lower level compared to the respective total FDI for South Africa inflows and outflows. As explained in the next chapter, there is still potential for future development and new foreign direct investment in South Africa, particularly in the mineral resources sector.

Furthermore, constant values can be observed regarding the number of German companies based in South Africa and the number of employees working there. Furthermore, annual revenues of these companies are increasing. This positive picture shows that local value creation in South Africa is possible for German companies.

#### **4.3.6 Examples for foreign direct investments**

Lastly, this chapter presents an example of a German company operating in South Africa. The company in question is the Daimler AG. They made an investment of around 600 million euros and created an additional area of over 100,000 square meters for their site in East London. The investment was made with the aim of producing the new C-Class at this site. (Cf. Daimler AG, 2018)

# 5. Analysis of mineral resources and value added for procurement purposes from South Africa

This chapter gives an overview of the world's mineral deposits and information about South Africa. This is followed by an analysis of future technologies with a demand for mineral resources from South Africa, which are combined in a resource-technology-matrix. Afterwards, three case studies on existing and future value added based on mineral resources are explained. Finally, factors of local value added for procurement purposes are presented.

## 5.1 Analysis of mineral resources

This section first provides an overview of the occurrence of mineral resources and their annual mining volume worldwide. Afterwards, the mineral resources in South Africa are described and the challenges in mining are highlighted.

### 5.1.1 Global mining of mineral resources

The 15 most important countries, see figure 20, have a total value of resources of 27,640 billion USD and represent 82 % of the total value of the world's mineral resources (Cf. BGR, 2019, p. 15 f.).

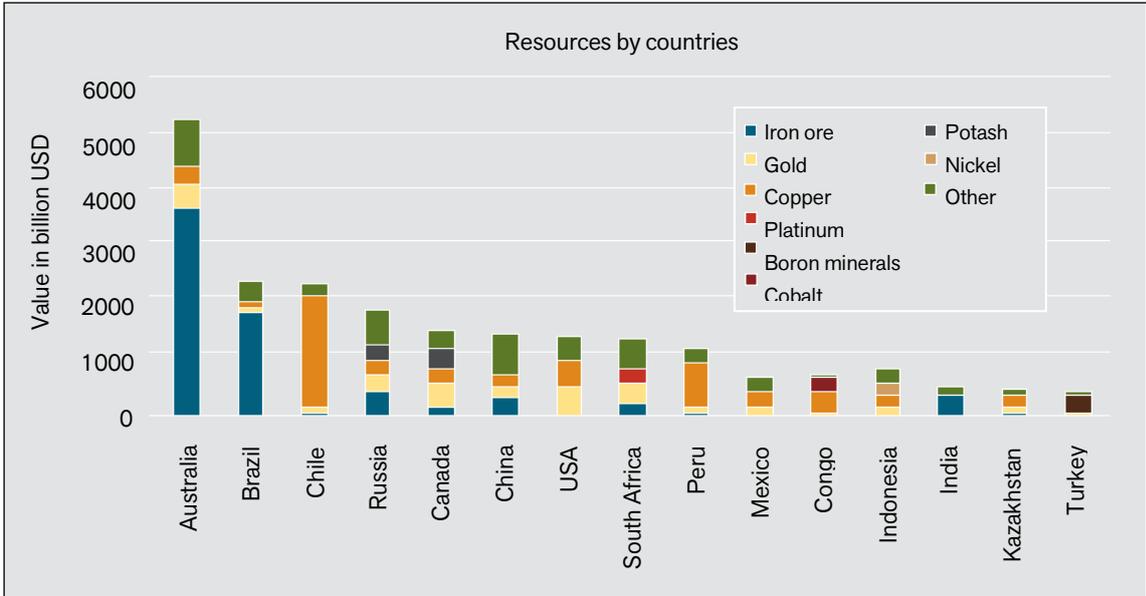


Figure 20 - Value of resources in USD billion in the 15 most important countries (Cf. BGR, 2019, p. 16) [Translated to English]

Resources in general are deposits, that either have not yet been determined with sufficient precision or cannot be mined economically with the technology currently available and at

current prices. They are only available to the mineral resources market in the medium to long term (Cf. BGR, 2019, p. 16). The resources considered are iron ore, gold, copper, platinum, boron minerals, cobalt, potash, nickel and all other commodities are grouped in other. It can be seen in figure 20, that the three countries with the largest share of mineral resources in the world are Australia with 5,400 billion USD, Brazil with 2,500 billion USD and Chile with 2,400 billion USD. South Africa is in eighth place with a value of 1,200 billion USD and the mineral resources iron ore, gold, platinum and many other minerals such as for example titanium, manganese or chromium, which are grouped in other (Cf. BGR, 2019, p. 16 f.). Looking at the current annual global mining production of minerals worldwide in 2017, South Africa with a resource value of 28 billion USD, also ranked on eighth place (Cf. BGR, 2019, p. 10).

### 5.1.2 Mineral resources in South Africa

Looking at the distribution of mineral resources on the map of South Africa, see figure 21, it is noticeable, that most resources are located in the northeast. There are also deposits of diamonds and copper in the west of the country.

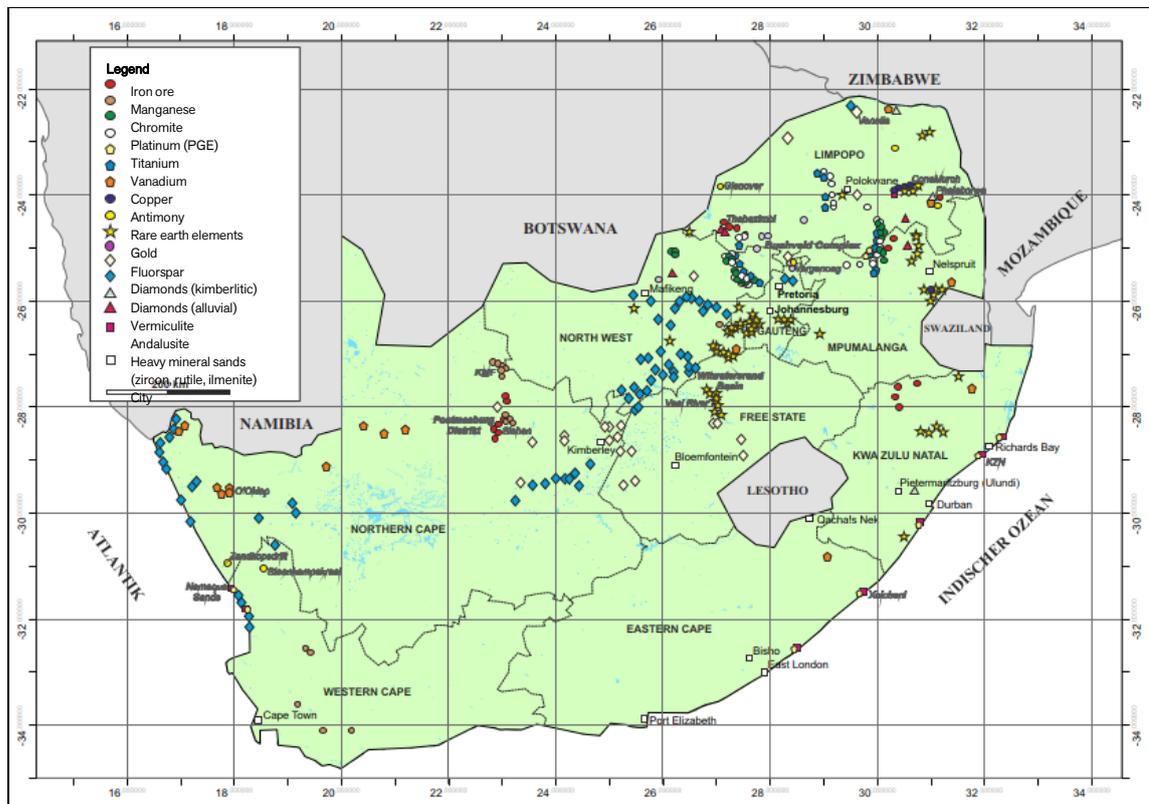


Figure 21 - Mining and mineral resources in South Africa (Cf. DERA, 2017, p. 81)

[Translated to English]

For a depth analysis of the mineral resources, the top 10 mineral resources in South Africa, based on their share of world mining production in percent, are considered and listed in

descending order below: platinum-group metals (PGM) with 78.3 %, platinum with 75.5 %, palladium with 40.8 %, chromium with 39.5 %, vanadium with 33.0 %, zircon with 32.1 %, manganese with 18.2 %, rutile with 14.4 %, titanium with 13.0 % and ilmenite with 11.7 % (Cf. BGR, 2014, p. 98). Since rutile and ilmenite are titanium compounds, they are grouped under titanium for further consideration (Cf. Mindat, 2021b; Cf. Mindat, 2021a). According to the United States Geological Survey 2021, the amount of PGM resources in South Africa include 63,000 t (Cf. USGS, 2021).

**5.1.3 Risks and challenges in the mining of mineral resources**

Considering the mineral resources in South Africa as a potential opportunity for exploitation, the next step is to consider the potential risks and challenges. The following figure 22 shows the weighted country risk of mineral resources<sup>1</sup> in 2018 at the ordinate and the country concentration [HHI]<sup>2</sup> at the abscissa.

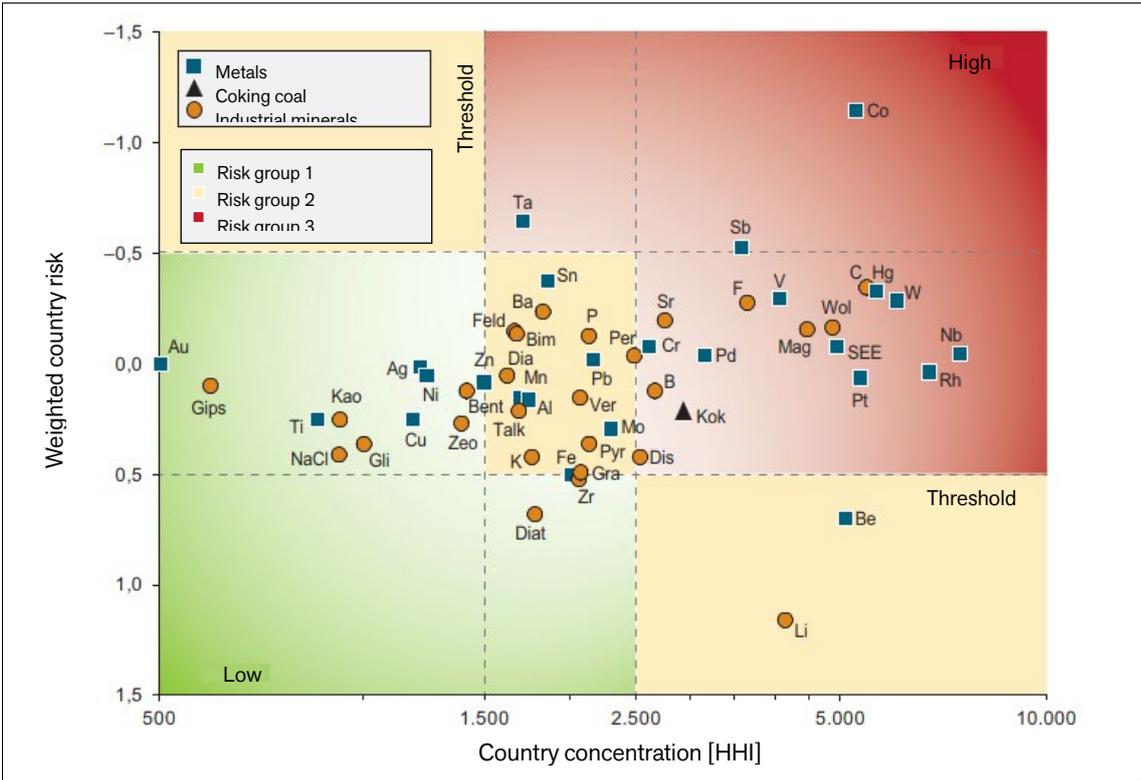


Figure 22 - Country concentration and weighted country risk of mine production for the year 2018 (Cf. DERA, 2021a, p. 16)[Translated to English]

The weighted country risk consists of: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law and control of corruption.

<sup>1</sup> The meaning of the abbreviations can be found at: <https://www.rsc.org/periodic-table>  
<sup>2</sup> HHI = Herfindahl-Hirschman Index

The country concentration [HHI] describes the number of countries mining these mineral resources. The lower the number of mining countries, the higher the risk (see monopolist). Based on figure 22, the top mineral resources in South Africa can be classified in high risk (platinum (Pt), palladium (Pd), chromium (Cr), vanadium (V)), medium risk (manganese (Mn), zircon (Zr)) and low risk like titanium (Ti) (Cf. DERA, 2021a, p. 12 ff.).

Further challenges will be deep-level mining with improved drilling technologies (Cf. DERA, 2017, p. 82) as well as compliance with (social) sustainability such as working conditions in the mines (Cf. Spiegel Online, 2018) to avoid labor strikes (Cf. WirtschaftsWoche Online, 2014).

## 5.2 Analysis of future technologies with mineral resources

This section provides an overview of future technologies and shows their feedstock requirements based on existing mineral resources in South Africa. The results are used to develop a resource-technology-matrix for South Africa.

### 5.2.1 Overview of future technologies

According to the German Raw Material Agency, the future technologies can be grouped into five clusters, see table 2: mobility and aerospace, digitalization and industry 4.0, energy technologies and decarbonization, recycling and water management, power and data networks (Cf. DERA, 2021b, p. 58 ff.)

Table 2 - Overview of future technologies in the appropriate cluster

Mobility and aerospace	Digitalization and Industry 4.0	Energy technologies and decarbonization
<ul style="list-style-type: none"> <li>▪ Lightweight passenger car construction</li> <li>▪ Electric traction motors for motor vehicles</li> <li>▪ Alloys for lightweight airframe construction</li> <li>▪ Automatic piloting of motor vehicles</li> <li>▪ Aircraft for 3D mobility</li> <li>▪ Superalloys</li> <li>▪ Lithium-ion high-performance storage</li> <li>▪ Solid state battery</li> </ul>	<ul style="list-style-type: none"> <li>▪ Indium tin oxide in display technology</li> <li>▪ Quantum computing</li> <li>▪ Optoelectronics/ Photonics</li> <li>▪ Microelectronic capacitors</li> <li>▪ Radio frequency microchips</li> <li>▪ Industrial robotics and Industry 4.0</li> <li>▪ Additive manufacturing of metal components ("3D printers")</li> <li>▪ Devices in the Internet of Things (IoT)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Thermoelectric generators</li> <li>▪ Thin-film photovoltaics</li> <li>▪ Water electrolysis</li> <li>▪ Direct-Air Capture</li> <li>▪ Stationary fuel cell</li> <li>▪ Carbon Capture and Storage</li> <li>▪ Redox flow storage</li> <li>▪ Wind turbines</li> <li>▪ High-performance permanent magnets</li> <li>▪ Synthetic fuels</li> </ul>
Recycling and water management	Power and data networks	
<ul style="list-style-type: none"> <li>▪ Seawater desalination</li> <li>▪ Raw material recycling (of plastics)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Expansion of power grid</li> <li>▪ Fiber optic cables</li> <li>▪ 5G (6G)</li> <li>▪ Data centers</li> <li>▪ Inductive transmission of electrical energy</li> </ul>	

(Own illustration based on DERA, 2021b, p. 58 ff.) [Translated to English]

The overview in table 2 is of particular importance, as the existence of these technologies is only possible through the use of mineral resources.

### 5.2.2 Demand for mineral resources of future technologies

Figure 23 shows an excerpt of mineral resources, that are required for future technologies (indicated in tons) and at the same time belong to the top 10 mineral resources in South Africa. For each mineral resource, the level of demand as of today based on 2018, the annual production volume based on 2018 and the three possible future scenarios (sustained path, middle path, fossil path), that will determine the level of demand for the mineral resources in 2040, is illustrated.

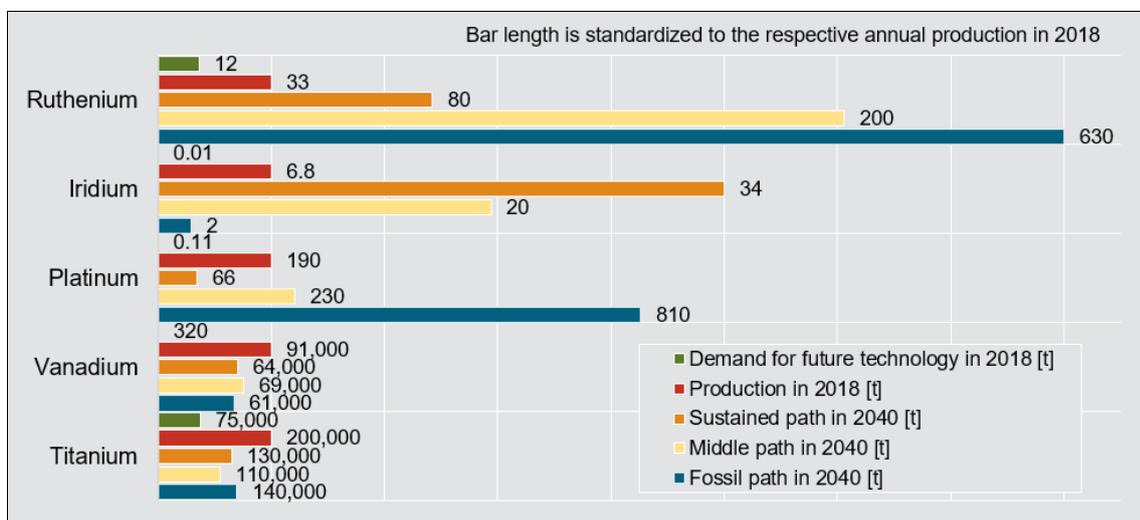


Figure 23 - Demand for different mineral resources for future technologies (in 2018) as well as in the three future scenarios (in 2040) compared to the production of the respective mineral resources (in 2018) (Own illustration based on DERA, 2021b, p.24) [Translated to English]

The three future scenarios are based on O'Neill, Kriegler, Ebi, et al., 2017. They described five shared socioeconomic paths, each consisting of the intersection of socioeconomic challenge for climate change adaptation and socioeconomic challenge for climate change mitigation. These include the sustained path, the middle path, the regional rivalry path, the inequality path, and the fossil path (O'Neill, Kriegler, Ebi, et al., 2017). Below, the sustained path, middle path, and fossil path are considered in relation to the socioeconomic challenges for climate change mitigation. Sustained path means: The world is shifting to a more sustained path and respecting ecological limits. Middle path means: Institutions are working global toward sustainable development goals but making slow progress. Environmental systems are deteriorating, although improvements are occurring. Fossil path means: The pursuit of

economic and social development is based on the exploitation of fossil fuel resources, and resource- and energy-intensive lifestyles are being adopted around the world (Cf. DERA, 2021b, p. 26 ff.). The information on the height of the bars of the different mineral resources is further processed in the following case studies in section 5.3.2 and 5.3.3.

### 5.2.3 Development of a resource-technology-matrix for South Africa

In this section, the findings from sections 5.1.2, 5.2.1 and 5.2.2 are combined and a resource-technology matrix is developed (see table 3). The first column of the table shows the future technologies (16 out of 33) whose mineral resource requirements can be met with mineral resources from South Africa. The first row shows the mineral resources in South Africa and their share of world mining production (8 out of 10) in descending order from left to right as described in section 5.1.2. The potential of the raw materials is determined based on future demand in 2040. A black dot means, that there will be a demand, but at present it is not possible to quantify the amount. If the demand for mineral resources will be at least 10 times higher, it will be marked with a green arrow pointing upwards. If the mineral resource demand will be less than 10 times as high, it will be marked with a yellow arrow pointing to the top right. If the demand remains the same or will be at most two times as high, then this is marked with a red arrow to the right.

Table 3 - Resource-technology-matrix for South Africa

Future technology (16 of 33)	Mineral resources in South Africa and their share of world mining production (8 of 10)							
	PGM (78.3 %)	Platinum (75.5 %)	Palladium (40.8 %)	Chromium (39.5 %)	Vanadium (33.0 %)	Zircon (32.1 %)	Manganese (18.2 %)	Titanium (13.0 %)
Lightweight passenger car construction					●		●	
Alloys for lightweight airframe construction								↗
Automatic piloting of motor vehicles						●		●
Superalloys	→	●		→		→	●	→
Lithium-ion high-performance storage							↑	
Solid state battery							↗	↗
Microelectronic capacitors			●			●	●	
Additive manufacturing of metal components ("3D printers")				↗			↗	↑
Thin-film photovoltaics	●	●						
Water electrolysis	↑	↗	●	↑		↑	↑	↑
Stationary fuel cell				↑		↗	↑	
Carbon Capture and Storage				↗	↑		↗	
Redox flow storage					↑			

Wind turbines				↗			↗	
Synthetic fuels	↑							
Data centers	↑	↑		→				
<ul style="list-style-type: none"> <li>● Potential not quantifiable, ↑ High potential (&gt; 10x increase in the future), ↗ Medium potential (&lt; 10x increase in the future),</li> <li>→ Low potential (consistent or max. 2x increase in the future)</li> </ul>								

(Own illustration based on BGR, 2014, p. 98; DERA, 2021b, p. 58 ff.) [Translated to English]

Two particularly important results can be taken from the matrix. On the one hand, the future technology of water electrolysis requires a particularly large number of mineral resources, which are also available in large quantities in South Africa. In addition, the future technology data centers requires two mineral resources, among others, which are also available in large quantities in South Africa. It can be deduced from this, that there is a particular high potential for local value added for these two future technologies. The potential of two future technologies is described in sections 5.3.2 and 5.3.3.

### 5.3 Local value added for procurement purposes based on mineral resources in South Africa

In this section, three case studies are presented, that show the existing and future potential (see section 5.2.3) of local value added in South Africa based on the mineral resource deposits in South Africa.

#### 5.3.1 Existing technology: case study exhaust gas catalytic converter

In 2019, South Africa exported 1.3 billion USD worth exhaust gas catalytic converters, with the value for Germany at 0.6 billion USD (Cf. GTAI, 2021b). In addition, the value of exhaust gas catalytic converters installed in exported vehicles must be added (see section 4.2.4).

In the automotive industry, the production of exhaust gas catalytic converters is of major importance, as they are needed to reduce emissions from combustion vehicles. The exhaust gas consisting of hydrogen, carbon monoxide and nitrogen oxide is converted into tail pipe emissions consisting of water, carbon dioxide and nitrogen. The chemical reaction of the catalysis is enabled by a coating of the metal. The coating requires alumina oxide, cerum oxide and rare earth stabilizers metals platinum, palladium and rhodium (Cf. Innovationdiscoveries, 2021). One reason for the local value added of exhaust gas catalytic converters in South Africa could be the high share of world mining production of the required mineral resources rhodium (78.3 %), platinum (75.5 %) and palladium (40.8 %) (Cf. BGR, 2014, p. 98). From this case study, two important results can be derived for the local value added of products related to the occurrence of mineral resources:

- (1) Many of the required mineral resources for a product are available
- (2) A high quantity of the required mineral resources are available

### 5.3.2 Future technology: case study water electrolysis

The technology of water electrolysis is needed for the production of hydrogen, which can be used as fuel for alternative mobility such as the hydrogen vehicles (Cf. DERA, 2021b, p. 178). There is a potential in the automotive industry such as for example by Daimler Trucks with the truck GenH2 (Cf. Daimler AG, 2021) and by BMW Group with the car iHydrogenNext (Cf. BMW Group, 2021). To produce hydrogen, water electrolysis splits water into oxygen and hydrogen. For this chemical reaction, the electrodes (anode and cathode) require a specific coating. The coating primarily requires the mineral resources aluminum, copper, nickel, iridium, platinum, chromium, zirconium, manganese and titanium (Cf. DERA, 2021b, p. 178).

In the following table 4, the first column lists the mineral resources required for water electrolysis and available in South Africa. In the second column, the share of world mining production (in percent) is shown. In the third column, the annual global demand based on 2018 is presented. The last three columns "Global demand in 2040" (non-cumulative), categorized as sustained path, middle path and fossil path, represents the result of section 5.2.2.

Table 4 - Global demand in 2040 of mineral resources for water electrolysis available in South Africa

Mineral resources in South Africa	Share of world mining production	Global demand in 2018	Global demand in 2040		
			Sustained path	Middle path	Fossil path
Iridium (Ir)	78.3 %	0.01 t	34 t	10 t	2 t
Platinum (Pt)	75.5 %	0.01 t	6 t	2 t	0.33 t
Chromium (Cr)	39.5 %	16.5 t	63,200 t	17,900 t	3,300 t
Zircon (Zr)	32.1 %	10.5 t	40,300 t	11,400 t	2,100 t
Manganese (Mn)	18.2 %	0.12 t	450 t	130 t	24 t
Titanium (Ti)	13.0 %	3.55 t	13,600 t	3,900 t	720 t

Other required mineral resources: aluminum (Al), copper (Cu), nickel (Ni), ...

(Cf. BGR, 2014, p.98; Cf. DERA, 2021b, p. 183)

Table 4 shows, that the demand for the mineral resources shown, regardless of the sustained, middle or fossil path, will increase sharply from the year 2018 compared to the year 2040. Furthermore, it illustrates, that if a sustainable path is taken, the demand is much higher than if a fossil path is maintained. This could be due to the fact, that hydrogen and thus water

electrolysis have the potential of sustainable mobility. Due to the high number and abundance of the required mineral resources for water electrolysis in South Africa and the potential of the hydrogen product, the potential for local value added for the coating of electrodes in South Africa can be classified as high and offers a high potential especially for the automotive industry.

**5.3.3 Future technology: case study data center**

In the context of digitalization, the technology of data centers and thus computer hard drives are becoming increasingly important. An elementary component of this is the disk, which requires the following mineral resources for its coating: ruthenium, platinum, chromium, cobalt, tantalum, neodymium. Table 5 below follows the same structure as in the previous section 5.3.3.

Table 5 - Global demand in 2040 of mineral resources for data centers available in South Africa

Mineral resources in South Africa	Share of world mining production	Global demand in 2018	Global demand in 2040		
			Sustained path	Middle path	Fossil path
Ruthenium (Ru)	78.3 %	0.1 t	44 t	167 t	592 t
Platinum (Pt)	75.5 %	0.1 t	60 t	230 t	813 t
Chromium (Cr)	39.5 %	0.02 t	10 t	38 t	133 t
Other required mineral resources: cobalt (Co), tantalum (Ta), neodymium (Nd)					

(Cf. BGR, 2014, p. 98; Cf. DERA, 2021b, p. 265)

Table 5 shows, that the global demand for mineral resources for computer hard drives in 2018, representing the current annual demand for mineral resources for computer hard drives, will increase sharply by 2040 regardless of the sustained, middle or fossil path. It can also be seen, that if a fossil path is maintained, the demand for all three mineral resources is more than approximately 13 times higher than if the sustainable path is chosen. Due to the high number and abundance of the mineral resources required for the disk for computer hard drives in South Africa and the potential of the product for the data centers, the potential for local value added for the coating of the disk in South Africa can be considered as high. This points to a high potential for local value added especially for the three largest manufacturers of computer hard drives such as Western Digital, Toshiba and Seagate (Cf. Statista, 2021a).

## 5.4 Factors to be considered for local value added

This section presents the factors country indices, local content regulations and labor skills and qualifications, that a company's procurement department should consider for local value added.

### 5.4.1 Country indices

For an initial overview of the conditions in a country, various indices can be used, which often allow a direct comparison with other countries. Examples include the Corruption Perception Index (see section 3.2.1), the Fragile State Index (Cf. The Fund of Peace, 2021) and the Economic Freedom Index (EFI) (Cf. Heritage, 2021a). The latter is described in more detail below, followed by a country comparison between the resource-rich countries (see section 5.1) Brazil, China and South Africa.

The EFI defines economic freedom as follows: "[...] individuals are free to work, produce, consume, and invest in any way they please. [...] governments allow labor, capital, and goods to move freely, and refrain from coercion or constraint of liberty beyond the extent necessary to protect and maintain liberty itself." (Cf. Heritage, 2021b). The index is measured by twelve quantitative and qualitative factors in four categories:

1. Rule of law (property rights, government integrity, judicial effectiveness)
2. Government size (government spending, tax burden, fiscal health)
3. Regulatory efficiency (business-, labor-, monetary freedom)
4. Open markets (trade-, investment-, financial freedom) (Cf. Heritage, 2021b)

A country's score is based on the average of the twelve economic factors, with each ranked on a scale of 0 to 100 and weighted equally (Cf. Heritage, 2021b). The exemplary country comparison shows the economic freedom on the basis of 184 countries in descending order (ranking of the country under consideration/ sum of all countries). Based on December 2021, for example, South Africa (99/184) has a better ranking than China (107/184) and Brazil (143/184) (Cf. Heritage, 2021a).

In summary, indices can be used as an initial indication of the potential for local value added. However, the complex calculation shows, that the significance of these values must be examined individually before a decision is made.

#### 5.4.2 Local content regulations

The term local content means, that a certain proportion (in physical units or in value terms such as percent) of the final product must come from domestic production. Developing countries in particular use this protectionist instrument to protect their domestic economy and switch from purely final assembly to the production of intermediate products (Cf. Krugman, Obstfeld & Melitz, 2006). Protectionism often sets up inefficient economic structures or maintains existing ones and is therefore not a long-term solution (Cf. VDA, 2021).

The German Federal Ministry for Economic Cooperation and Development describes in its article "Globale und lokale Rohstoffwirtschaft", that mining in resource-rich partner countries of German development cooperation is of high importance due to the creation of jobs and generation of state revenues. Sustainable mining and the attractiveness for investments should be achieved through stable framework conditions. To this end, local content regulations are used, such as "a certain proportion of supplier parts must be manufactured in the own country or that a certain number of national workers must be employed". The goal is to strengthen local value added with an own supplier and processing industry (Cf. BMZ, 2021).

The Department Trade and Invest of South Africa (DTI) describes in its publication "Guidance Document for the Calculation of Local Content", that in order to calculate local value added, the import value of a product must first be calculated to determine the local content of a product. Then, the local content of a product, expressed as a percentage, is determined by subtracting from the bid price the value of the imported content. Thus, the local share of a product in terms of value can be determined by components, materials and services to be used in the production of the products (Cf. DTI, 2021, p. 2 ff.). From the previous descriptions of local content regulations, the procurement department is recommended to inform itself about the amount of the required local content share and the implementation options for achieving the requirements.

#### 5.4.3 Labor skills and qualification

The Department of Higher Education and Training of South Africa describes in its report "Skills Supply and Demand in South Africa", that the skills requirements in an economy vary depending on the country's state of development and each country can be classified into three types (Cf. DHET, 2019, p. 10):

1. Factor-driven economy: Agriculture and mining are the drivers of economic growth, which is largely based on unskilled labor,
2. Efficiency-driven economy: Competitiveness, efficient production processes and improved production quality are the drivers of economic growth, which is largely based on skilled labor,
3. Innovation-driven economy: Economic growth is largely based on know-ledge-intensive companies and the service sector (Cf. DHET, 2019, p. 10).

The South African economy was ranked globally as an efficiency-driven economy in 2018 (Cf. GEM, 2018, p. 11). It should be noted, that skilled labor is employed primarily in the tertiary sector, while unskilled labor tends to be employed in the primary sector and construction. For the procurement department of a manufacturing company, before implementing local value added, it must be ensured, that workers are available who can perform the required steps, or a conscious decision must be made for the targeted qualification of skills.

## 6. Conclusion

The PEST-analysis shows that the country is an advanced economy with a progressive constitution, good infrastructure, and immense reserves of raw materials, although it is still a developing country with social inequality and high unemployment with a poor education system. Moreover, there are still some difficulties connected to the history which results in conflicts between the different ethnicities. The economy still needs time to recover from the Covid-19 Pandemic. To sum up there is great potential but also risks for companies which want to expand to South Africa.

As shown in chapter 4, there is an intact business relationship between Germany and South Africa. This is characterized on the one hand by increasing South African exports to Germany in individual product groups such as mining products. On the other hand, on the steady foreign direct investment of German companies in South Africa and the constant number of German companies based there, as well as their number of employees.

The chapter analysis of mineral resources and value added for procurement purposes from South Africa shows, that South Africa with its share of the world's mineral resources, has a high potential to meet the demand for mineral resources for future technologies (16 out of 33). Another finding is that the potential for local value added for procurement purposes depends on the availability and quantity of mineral resources for future technologies. In this context, a high potential was identified for the future technologies water electrolysis and data centers. Factors to be considered for local value added are country indices, local content regulations and labor skills and qualifications.

Based on the explanations above, the hypothesis "South Africa as an upcoming procurement destination" is confirmed regarding future technologies and their demand for mineral resources. If Germany invests in future technologies mentioned above, then business relations with South Africa should be expanded.

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