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What Constrains Southern African Countries from Further Improving Their Supply Chain Performance?

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Preface

The idea of this research goes back to the year 2012 and my observations in the context of an internship at a freight forwarder in Namibia and journeys in southern Africa. At that time, I asked myself, why is supply chain performance in countries in southern Africa so different from country to country. I realised that there was already a plethora of reports on supply chain performance in southern Africa. These reports did not, however, answer my question. To cut a long story short, I came up with a research proposal on "What constrains southern African countries from further improving their supply chain performance?" After five years of desk and field research as well as various discussions and conversations, with this thesis I attempt to provide an answer to this question. I trust that this work contributes to the existing body of knowledge on constraints of supply chain performance in particular in southern African countries. I guess this work also contains interesting starting points for further applied research on constraints and stages of supply chain performance of countries.

In this preface, I would like to express some thoughts that have guided my research. Throughout this research, I regarded myself as the one who provides the methodological approach and tools to tap, process and merge the knowledge of experts in order to find a holistic answer to what constrains the selected countries from further improving their supply chain performance. As a foreigner in the countries of analysis, based on my limited knowledge, I would not be able to make sound recommendations. Hence, this work attempts to reflect local experts' knowledge and recommendations.

An essential consideration here is that the realisation and results of this research project rest on the support and commitment of many people and organisations. I would like to convey my appreciation to the following people and organisations.

I want to thank my thesis supervisors Prof. Dr. Stephan Panther and Prof. Dr. Winfried Krieger for their support of my professional and personal learning and development. Prof. Panther provided guidance and inspiration in the field of institutional and development economics. He facilitated the realisation of this project by granting support in various aspects, such as many discussions as well as endorsement for the scholarship. Prof. Panther also provided impetus in the selection of cases. Prof. Krieger provided guidance and inspiration in the field of logistics and supply chain management. He facilitated the realisation of this project by granting support in various aspects, such as countless discussions, organisational support as well as endorsement for the

scholarship. Moreover, both provided a less apparent but crucial factor to this research – the trust that with their guidance I will be able to put this research project into practice.

I am grateful to the two universities, which supported and facilitated this research project, the Hochschule Flensburg – Flensburg University of Applied Sciences with its School of Business and the Europa-Universität Flensburg with its International Institute of Management and Economic Education. These two universities provided the necessary environment to conduct such a research project. This includes subject-specific and organisational support by various staff members. The subject-specific exchange of ideas and expertise with fellow PhD students provoked valuable food for thought. My unequivocal thanks goes to staff members of the Zentrale Hochschulbibliothek Flensburg, who provided an indispensable and, at the same time, accommodating support.

I also could not have provided this research project and thesis in adequate written English without the support of Victoria Richter. From an early stage on, Vicky supported this project. She consulted on and proof read the research proposal in 2013, the management summary, the online questionnaire as well as the final thesis in 2018.

I am also grateful to the Department of Transport and Supply Chain Management at the University of Johannesburg, in particular Sumayah Nabee for getting in touch with me and supporting me extensively throughout my stays in South Africa as well as Prof Jackie Walters for supporting and approving my stays. I want to thank the German-Namibian Centre for Logistics at the Namibia University of Science and Technology for supporting my stay in Namibia. I also want to thank the Centro de Estudos e Investigação Científica da Universidade Católica de Angola, in particular Regina Santos and Prof Alves da Rocha for enabling my stay in Angola and the exchange of ideas.

My stay in Angola would have been much more difficult and my research much less fruitful without the extensive support of Adérito Mavenda. He assisted in everyday life in Luanda and contributed significantly to my travel experiences and research stay.

The analysis and results of this work draws in information from many people and organisations. Without the willingness of many people and organisations in Angola, Namibia, South Africa and Germany to complete the online survey and to participate in a personal interview, this research project would not have been feasible. For the sake of privacy protection, the interviewee and company names are not published. Nonetheless, I am aware of, and I am grateful to every single interviewee and respondent.

I would like to express my thanks to two people who dedicated a considerable amount of time to proof read the thesis and appendix and who provided valuable feedback on the draft, namely, Daniel Kreitschmann and Arne Möller. Their support helped me through the final stages.

I am grateful for the support of the German Academic Exchange Service – Deutscher Akademischer Austausch Dienst (DAAD). Their PhD scholarship not only provided financial assistance, but, equally important, their application procedure and conditions urged me to properly plan and conduct the research journeys. This includes the need for support by universities and research organisations in the selected countries.

My lasting gratitude goes to my family; to my parents, Silke and Manfred, for playing a considerable role in shaping my mindset but also for creating the conditions of this undertaking; to my sister, Sandra, for her support during the finalisation of this report; and to my girlfriend, Swantje, for accompanying me on this tough journey from the early beginnings on up to its completion, for her support in planning and realising the journeys but also for urging me to round this project off within reasonable time.

Flensburg, April 2018   Stephan Hofmann

1   Constraints of Supply Chain Performance in Southern Africa

Seaports, road transport networks, rail transport networks and manufacturing locations as well as their coordinating operations (hereinafter subsumed under supply chains) are characterised by very different levels of performance in southern Africa. Comparisons of supply chain performance across southern African countries indicate the following situation: Only very few countries can be described as supply chain performers. There are countries which can be characterised as upper or lower partial supply chain performers. Then, there are countries, which can be referred to as supply chain underperformers (Arvis et al. 2016: 9-10, 38-41; UNIDO & UNCTAD 2011: 43-51; WEF 2017: 326-332). To put it differently, the majority of countries fall well short of their supply chain performance potential. This is despite the fact that supply chain performance decides on the involvement of an economy in today's fragmented and international value networks (Saslavsky & Shepherd 2012). The involvement into international value networks, in turn, has an impact on the design of local value networks of an economy. Thereby, supply chain performance can make a considerable contribution to economic growth as well as economic development of a country. At the same time, in many countries in southern Africa economic development in the wide population is relatively low (UNDP 2016: 198-201).

Targeting to improve every determinant of supply chain performance that does not meet expectations may seem tempting. However, because of scarce resources, improving everything that does not meet expectations but contributes to supply chain performance is unlikely to be successful (cf. Hausmann & Rodrik & Velasco 2008: 329; UNIDO & UNCTAD 2011: 34). Investments need to be directed to their most effective and efficient use. Hence, a binding constraint approach to supply chain performance seems promising. This research project aims at identifying binding constraints of supply chain performance as well as identifying and assessing improvement measures in order to increase supply chain performance in selected countries of the mainland Southern African Development Community (SADC).

The analysis recognises that measures exist that lead to improvements in supply chain performance in an average country. The countries under analysis may, however, not conform to the average country. Because of the various intervening factors and their interactions in the countries under analysis, their situations are likely to differ

(cf. Hausmann & Klinger & Wagner 2008: 4-6, 85; UNIDO & UNCTAD 2011: 34). This research acts on the assumption that the countries under analysis are subject to a specific context. Their individual context may have an influence on their constraints and appropriate measures for improvement. Therefore, this research is highly context-specific. The analysis acknowledges that both public and private as well as public-private factors determine supply chain performance. Therefore, this research takes on a comprehensive identification approach and considers improvement measures from a private and public as well as public-private sector point of view.

Research Objectives and Questions

The overarching research objectives that guide this research are threefold.

First, to make a start, this research aims to identify supply chain performance in selected mainland SADC countries. The first objective raises three questions:

    a) How can supply chain performance be defined at a country level?

    b) How can supply chain performance be measured at a country level?

    c) What is the current state of supply chain performance in selected countries?

Second, this research aims to identify factors that constitute binding constraints of supply chain performance in selected mainland SADC countries. The second objective raises the following two questions:

    a) How can constraints of supply chain performance be identified?

    b) Which factors constitute binding constraints of supply chain performance? Economic, political, cultural, technical and organisational factors are taken into account.

Third, it aims to identify as well as assess improvement measures in supply chain performance from a private, public and public-private sector point of view in selected mainland SADC countries. The third objective raises the following two questions:

    a) What are the direct factors that could be improved in order to increase supply chain performance?

    b) What are the indirect factors that could provoke actions by private companies in order to increase supply chain performance?

Resarch Approach and Design

A case study research design is used to identify binding constraints as well as actions for improvements in southern African countries. A quantitative method, i.e. a questionnaire, and a qualitative method, qualitative interviews, as well as secondary benchmarking data are combined to a convergent parallel mixed methods design. It follows the growth diagnostics approach (cf. Hausmann & Rodrik & Velasco 2008).

Cases and Limitations

This research is subject to the following limitations:

First, the scope of this research is limited in its geographic coverage. For the preliminary analysis, the cases to be taken into account are confined to the mainland SADC countries, namely Angola, Botswana, Democratic Republic of the Congo (DR Congo), Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.[1] This is because the mainland SADC countries differ considerably from country to country in various characteristics. A larger scope could only be achieved at the expense of a sufficient degree of detail. In addition, island-states, such as Madagascar, Mauritius and the Seychelles are explicitly excluded from this work. The case selection process further limits the scope to three to four coastal countries. Without pre-empting the case selection process, it can already be stated that the case selection has limited the scope to three coastal countries in southern Africa. The three countries have a number of common characteristics, but differ significantly in their level of supply chain performance. These countries include, as a supply chain underperformer, Angola, as a partial supply chain performer Namibia as well as the best supply chain performer in southern Africa, South Africa. Since neighbouring countries justify and determine requirements to supply chain performance of coastal countries (cf. AfDB 2010: 40), their neighbouring countries are included as peripheral cases.

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1   For the sake of brevity, the conventional shortforms are used throughout this work.

Second, the scope of this research is limited in its functional coverage. In 2015, the UNCTAD (2016: 6) estimated that maritime transport accounts for more than 80 percent of international trade volume in merchandise goods[2]. Maritime transport is estimated to account for between 55 and 67 percent of international trade value in merchandise goods (UNCTAD 2016: 6). In the past decades, especially between 1986 and 2000, international trade grew more rapidly than global production. In the future, international trade growth is expected to match or fall below global production growth. International trade growth was particularly high between 1990 and 2008 (UNCTAD 2016: 2, 4,). Whilst specialisation and fragmentation of supply chains may have reached a level of maturity in developed countries, it still offers much room for participation of developing countries in international supply chains (UNCTAD 2016: 25). Because of the expected growing importance of ports and their hinterland links in developing countries, this work sets its focus on seaports, road transport as well rail transport networks. To ensure that the focus is not only on connectivity[3], but also on local value creation, manufacturing locations[4] are taken into account as well.

Inland waterways, similar to ocean waterways, offer a relatively cost-efficient mode of transport. However, year-round navigable inland waterways are rare in southern Africa. Transport on inland waterways is generally of low importance to supply chains in southern Africa. The few inland waterways are provided by the rivers Congo, Zambezi and Shire as well as by the lakes Victoria, Tanganyika and Malawi (AfDB 2010: 117-118). For this reason, inland waterway transport is excluded from this work.

Certainly, air transport is an important mode of transport, for low volume and high value goods, in intra-industry trade and in the case of deficiencies in other modes of transport (cf. AfDB 2010: 9). Air transport constitutes a critical component of supply

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2   Merchandise trade "(…) covers all types of inward and outward movement of goods through a country or territory including movements through customs warehouses and free zones. Goods include all merchandise that either add to or subtract from the stock of material resources of a country or territory by entering (imports) or leaving (exports) the country's economic territory" (WTO 2016: 76-77).

3   Global connectivity and connectedness, respectively, can be defined as "(…) the depth and breadth of a country's integration with the rest of the world, as manifested by its participation in international flows of products and services, capital, information, and people" (Ghemawat & Altman 2016: 69, 79; developed by Held et al. 2000).

4   The author holds the view that agriculture and industial production should not be regarded as competing, but rather as complementary sectors with mutually reinforcing linkages as part of the development of an economy (cf. UNIDO & UNCTAD 2011: 31). This holistic understanding of manufacturing pervades this entire research project.

chains in countries that are planning to intensify and countries that are already involved in trade of low volume and high value goods and in intra-industry trade. However, to ensure that the focus of this research is not compromised, air transport is generally excluded from the scope.

The focus of this research is on cargo or freight transport and manufacturing locations. For this reason passenger transport is generally excluded from this research.

The focus of this research is on general and dry bulk cargo or freight. Liquid bulk cargo transport may be different. For this reason, pipeline transport is excluded.

Outline and Organisation

This thesis is organised into eight chapters: The present chapter, chapter one, starts by describing the research problem and its relevance, stating the aim of this work, defining the research objectives and questions as well as setting out limitations. At this very moment, chapter one is presenting the outline and organisational structure.

Chapter two sets the framework in which this research is placed. First, it establishes the terminology on logistics and supply chains and, second, on economic growth and development. Third, it identifies causal mechanisms between supply chain performance, on the one hand, and economic growth and development, on the other hand. Fourth, chapter two reviews existing approaches to supply chain performance measurement that are expected to provide entry and reference points to the selection of cases as well as to the identification of constraints of supply chain performance.

Chapter three develops a research approach, design and methods to identify constraints of supply chain performance as well as to derive actions for improvement.

Chapter four turns to the case selection. First, it analyses information on the stage of economic development and supply chain performance in 12 southern African countries. Second, based thereon, it reduces the broader scope to three or four countries.

Chapter five analyses information on country characteristics that affect supply chain performance as well as on the state of supply chain performance in the selected countries in more detail. This analysis of information is expected to provide points of entry and reference for the identification of constraints of supply chain performance.

Chapter six concentrates on the collected expert information. First, chapter six sets out the procedure of the selection of experts and presents sample characteristics. Second, it analyses the parameters that interviewees take into account when making

their decision on the choice of seaports, road transport networks, rail transport networks and manufacturing locations. These parameters are compared to the compiled attribute structure of the questionnaire in order to assess their level of compatibility. Third, chapter six presents the interview core statements and questionnaire responses on constraints of suppy chain performance in Angola, Namibia and South Africa.

The previous chapters laid the foundation for what is to come in chapter seven – the diagnostics of binding constraints of further improvements in supply chain performance in Angola, Namibia and South Africa. First, factors that represent binding constraints of further improvements of supply chain performance are identified. Economic, political, cultural, technical and organisational factors are taken into account. Second, based thereon, actions that are expected to lead to improvements are identified. These include actions that are expected to directly lead to improvements as well as actions that are expected to provoke actions by other stakeholders. Responsibilities and potential obstacles to the realisation of further improvements are set out.

Chapter eight takes a look back at the major results of this research project, draws conclusions regarding the three selected countries and sets the wider scope of application as well as specifies aspects, which deserve future research.

Note that this thesis is supplemented by the appendix publication. The appendix presents details on the data collection instrument as well as the interview documentation.

2 Supply Chain Performance and Development

Chapter two sets the framework in which this research is placed. First, chapter two establishes the terminology on logistics and supply chain and, second, on economic growth and development. Third, it identifies causal mechanisms between logistics and supply chain performance, on the one hand, and economic growth and economic development, on the other hand. Fourth, chapter two reviews approaches to supply chain performance measurement that are expected to provide entry and reference points to the selection of cases in chapter four as well as to the idenfication of constraints of supply chain performance in chapter seven. Chapter two provides an answer to the research questions how supply chain performance can be defined at a country level and how supply chain performance can be measured at a country level.

2.1 Logistics and Supply Chains

Logistics is the process that plans, implements and controls procedures for the efficient and effective transportation and storage of goods. Logistics includes additional services as well as information flows that occur between the point of origin and destination. Transportation, storage, additional services as well as information flows should be aligned towards customer needs (CSCMP 2013: 117).

Logistics management is the integrating function that plans, implements and controls the bi-directional flow of goods, services and pertaining information between points of origin and destination. In addition to typical logistics functions, such as network design, demand and supply planning, transportation, inventory management and fulfilment, logistics management occasionally covers further extended functions such as sourcing, procurement, production planning and control, assembling, packaging as well as customer service (CSCMP 2013: 117).

The basic unit of logistics can be regarded as the logistics cycle. Each logistics cycle consists of an input, like an order with product and service specifications, a processing part like procurement, manufacturing or delivery process, and an output, like the delivered product and service. Between those logistics cycles, backward and forward-oriented transportation and communication links exist. A single company or multiple companies can perform and control a logistics cycle (Bowersox & Closs & Cooper 2010: 41). The degree to which the output requirements of a logistics cycle have been

met is referred to as logistics effectiveness. The amount of resources used to meet the output requirements of a logistics cycle is referred to as logistics efficiency. Both logistics effectiveness and efficiency form the logistics performance concept (Mentzer & Konrad 1991).

Supply Chain is the process that stretches from processing of raw materials to the provision of goods and services to the final customers. Material and information flows link many organisations along a supply chain (CSCMP 2013: 186).

Supply chain management can be defined as the integrating function that builds on logistics management and additionally covers sourcing, procurement, manufacturing as well as the coordination and cooperation with marketing, sales, finance, information technology and product development across several companies. Supply chain management takes on a comprehensive perspective that integrates and aligns all processes from first point of origin, through multiple intermediate levels, to the last point of destination (CSCMP 2013: 187). In contrast to logistics management, supply chain management recognises that that there is a need of cross-company integration (Christopher 2011: 15). Today and even more in the future competition does not so much take place between individual participants or components of supply chains but rather between entire supply chains (Christopher 2011: 15; Fleming & Baird 1999: 392; Mangan & Lalwani & Fynes 2008: 35; Robinson 2002: 248; Suykens & Voorde 1998: 257).

The combined logistics cycles make up a supply chain. The degree to which the output requirements have been met along the supply chain is referred to as supply chain effectiveness. The amount of resources used to meet the output requirements along the supply chain is referred to as supply chain efficiency. These two components form the concept of supply chain performance (Bowersox & Closs & Cooper 2010: 41).

Based on these concepts and considerations, the entirety of supply chains that run through and take place within the boundaries of a country and their level of performance is considered in this research as supply chain performance of a country or at a country level. Since organisational and technological as well as demand and supply characteristics are changing or, more specifically, increasing, the effectiveness and efficiency frontier of supply chain performance is likely to be extended in the future.

2.2 Economic Growth and Development

A sustained increase in per capita production output is referred to as economic growth. It often comes along with a change in the structure of the economy (Kuznets 1966: 1; North & Thomas 1973: 1). The real per capita output in terms of gross national product (GNP) or gross domestic product (GDP) per capita are typically used to measure economic growth. The GNP measures the value of goods and services produced by an economy's citizens and their owned companies in foreign economies within a certain period. The fact that international cross-ownerships of companies are increasing speaks in favour of the use of the GNP. However, because measuring the source of ownership of companies in a domestic and foreign economy is more difficult than using an economy's borders as a separator, the GDP is more frequently used. The GDP measures the value of goods and services produced within an economy's territory without consideration of ownership of companies (Berg 2012: 61-63). Initially, the GDP was designed to provide information on the productive performance of a country as well as to design and implement economic policies (Berg 2012: 71). In the course of time, however, the GDP also became the dominant approach not only to measure economic growth but also human welfare (Bergh 2007: 2, 19). This results from the fact that an income approach – in contrast to a production and expenditure approach – can be used to calculate the GDP.[5] For this reason, if adjusted for changes in terms of trade the GDP is also referred to as the Gross Domestic Income (GDI) (OECD 2018). However, a number of characteristics confine the appropriateness of the GDP for measuring economic growth and in particular human welfare:

First, GDP only measures the value of activities that are provided in the formal economy; it disregards the value of activities that are provided outside the formal economy. That is, neither does the GDP measure the value of goods and services that have been provided in the informal market, nor does it measure the value of goods and services that have been produced or provided within the household. This causes differences between the GDP and the actual level of production. The level of activities outside the formal economy is usually higher in developing than in developed countries.[6] The disregard of informal activity can cause changes in GDP in developing

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5 Notwithstanding, all three approaches should yield the same result (IMF 2018).

6 Interesting to note here is that Medina & Schneider (2018) estimated the size and development of the shadow economies of 158 countries between 1991 and 2015. Their focus was on the legal shadow economy, excluding illegal activities and informal household activities, i.e. if recorded, activities that would contribute to the GDP.

economies as production shifts from the informal to the formal economy. The same sudden change occurs as production shifts from the household to the market. Although these changes are not caused by additional production but rather by first registration, they cause the GDP to grow and to raise the level of GDP (Fuess & Berg 1996; Fuess & Berg 1998; Berg 2012: 71-73). Even though the benefits of these goods and servies have already been enjoyed, it is only now that the costs of these goods and services are taken into account (Bergh 2007: 8).

Second, increases in production output cause the GDP to increase – irrespective of whether the production output is positive, neutral or negative. Increases in military investments, in correction of destruction and in medical attendance cause the GDP to increase. Negative factors can lead to an increase in GDP, although the human welfare is decreasing (Berg 2012: 75-76). Investment always leads to increases in GDP irrespective of whether these investments provide any additional benefits and whether these investments have been directed to their most efficient use, as Feige (2007: 55) points out with regard to transport infrastructure. Likewise, Berg (2012: 76) points out although investments entail opportunity costs, neither is the GDP designed for capturing opportunity costs nor is it able to capture total opportunity costs of investments.

Mishan (1967) remarks that compared to some centuries ago, human welfare is not only much higher today, further production expansion is, at the same time, accompanied by considerable disadvantages for human welfare. The notion that increasing productive expansion leads to increasing human welfare cannot be accepted anymore. Thus, Mishan argues that GDP should be considered as the costs of all market activities and increases in economic growth as the costs of productive expansion. Daly (1992: 99 et. seqq.) argues that as economic production output increases, the marginal benefits decrease whilst the marginal costs increase. Because there is no separation of benefits and costs, total monetary production output should only be considered as costs; total monetary production output growth should be only be considered as the costs of greater production output, such as resource depletion, labour input and pollution. Bergh (2007: 3) concludes that economic growth should not be regarded as an indicator of human welfare, but rather as the costs of adapting the economy.

Third, many goods and sevices of the natural environment are not or not adequately reflected in the GDP. Since many environmental goods and services are not provided through markets, their benefits and costs do not appear in the GDP. The actual costs

of utilising natural resources may be higher than the GDP suggests (Weitzman 1999). The actual cost of natural resources may only become visible in the future, such as depletion of natural resources as well as other negative effects (Berg 2012: 76-77). Provided that human welfare should not only be at the disposal of the present population, but also of the future population, sustained economic growth is inevitable. Present economic growth that goes at the expense of future economic growth and human welfare cannot be seen as an improvement in human welfare (cf. UNDP 1996: 16).

Fourth, to account for changes in the size of the population, the GDP per capita is used to make meaningful conclusions on human welfare. However, because the GDP per capita is a simple average without any consideration for the distribution of income among the population, meaningful conclusions on the human welfare of a population may be difficult (Nussbaum 2011: 47-49; Sen 1983: 756). An adequate indicator of human welfare should reflect income distribution among individuals of a population.

Fifth, GDP does not adequately account for changes in time spent on labour and leisure time. On the one hand, people may work more and earn more. This would cause the GDP to increase and suggest an increase in welfare. People may just as well reduce working hours in favour of leisure time and thereby increase their welfare. This, however, would cause GDP to fall and, thus, suggest a fall in welfare (Berg 2012: 74-75).

Sixth, since life expectancy varies significantly, the GDP with its annual perspective says nothing about the duration people can enjoy a certain level of economic welfare. An adequate indicator of human welfare should reflect the duration individuals are able to enjoy a certain level of economic welfare (Berg 2002: 186; Berg 2012: 77-78).

Finally, GDP does not indicate the welfare value added by the consumption of goods. For instance, on the one hand a greater variety of products can provide more choice and increase welfare, whilst, on the other hand too much variety could actually make transactions cumbersome and decrease welfare (Berg 2012: 80-81).

In addition to the described aspects that confine the appropriateness of the GDP as an indicator of human welfare, a number of factors regarding the comparability of GDP across countries and time impede its explanatory power (cf. Berg 2012: 63-65).[7] Since

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7   Boskin et al. (1998) found that due to substitution effects and quality improvements, the consumer price index overstates the actual increase in inflation and, thus, understates der real GDP growth rate. Gannamaneni (2017) found that digital technologies lead to improvements in human welfare; these are not, however, captured by the GDP.

the above outlined deficiencies dominate the appropriateness of the GDP as an indicator for human welfare, the criticism here is limited to these primary deficiencies.

Sen (1983: 748, 760) and Nussbaum (2011: 13) argue that economic growth is only one means to achieve human welfare and economic growth cannot be equated with human welfare. Rather, what an individual can do and achieve, i.e. entitlements and capabilities, should be placed at the centre (Sen 1983: 754; Sen 1999: 36; Nussbaum 2011:17). A more comprehensive understanding of human welfare is inherent in the concept of human and economic development. Goulet (1971: 85-95) specifies three common values and goals, namely, life-sustainance, esteem and freedom, of societies. These goals may be regarded as goals of (human) development. Adelman (2000: 1) states that self-sustaining growth, structural changes in patterns of economic production, technological upgrading, social, political and institutional modernisation as well as widespread improvement in human conditions combined represent the concept of economic development. One of the various more comprehensive indicators of human and economic development is the human development index (HDI), since 1990 annually published by the United Nations Development Programme (UNDP). The HDI covers the dimensions long and healthy life, knowledge as well as a decent standard of living. These are represented by the indicators life expectancy at birth, mean years of schooling and expected years of schooling as well as GNP per capita at purchasing power parity (PPP) in US-Dollars (UNDP 2013b: 1). Up to the revision of the HDI methodology in 1999, the income component had a strong effect only on low-income countries; above an income threshold, the effect was only very low. Since the revision in 1999, the income component has a considerable effect even at higher income levels, but the returns to welfare diminish progressively (Anand & Sen 2000: 88, 90; UNDP 1999: 90). Berg (2012:130) states that the HDI with its additional and more comprehensive variables means an improvement in measuring economic development in holistic terms. However, what remains unconsidered is the fact that the determinants of happiness make an important contribution to welfare and thus to economic development. At the same time it is, however, difficult to measure the high number of factors that affect happiness (Berg 2012: 116). Similarly, in 2017, the World Economic Forum introduced the Inclusive Development Index (IDI). The IDI aims at providing an indicator that goes beyond GDP growth and takes growth and development, inclusion and intergenerational equity and sustainability factors into account (WEF 2017: 6).

An interesting concept in this discussion is Maslow's hierarchy of needs (cf. Maslow 1943; cited from Maslow 1970). Although initially not specifically meant for measuring human welfare[8], Maslow's hierarchy of needs may help to explain the structure and attainment of human welfare. At the first level of the hierarchy are physiological needs, at the second safety and security needs, at the third belonging needs, at the fourth self-esteem needs and at the firth self-actualisation needs. The levels interrelate in a lexicographical preference ordering (Bergh 2007: 4). Only once lower level needs are fulfilled, higher level needs become relevant. Clarke (2005: 1) states that well-being or human welfare is determined by the extent to which a population attains the highest level, self-actualisation. It is only mentioned in passing that the hierarchical structure in Maslow's model is by no means undisputed. Goulet (1971: 239) states that every society, irrespective of their achieved level of welfare, requires the satisfaction of non-primary needs. Max-Neef (1991: 17) states that apart from basic subsistence, there is no hierarchy among human needs but rather complementaries and trade-offs.

Despite the critisims of the GDP as an indicator of human welfare so far, there is an important aspect that argues in favour of GDP as a partial measure of human welfare. Income and human welfare are significantly positively correlated up to a certain income level. Above that level, welfare is subject to diminishing returns (Frey & Stutzer 2000: 925; Di Tella & MacCulloch 2008: 17; Helliwell 2003: 344). The threshold may, however, vary considerably according to the context (Anand & Sen 2000: 84). These findings correspond to the lexicographical order in Maslow's hierarchy of needs. The first level, basic needs and second level, safety and security needs are strongly correlated with income level in such a way that income allows the buying of nutrition or having a roof over one's head. Then, the above top three needs of the pyramid relate more to the happiness determinants of welfare rather than to endowment components. The result of this is that at least for low-income or developing countries GPD per capita could remain a quite significant explanatory variable for human welfare. Above an income level, human welfare depends on more variables than just monetary production output. In addition, Anand & Sen (2000: 100) remark that income does not only allow for basic needs and security, but may also facilitate higher needs. Anand & Sen do by no means argue in favour of a sole reliance on GDP, but they highlight its high importance as part of a comprehensive human development index. Interesting in this regard are two statements: First, the authors of the Global Competitiveness

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8   Maslow's hierarchy of needs was designed to explain human motivation.

Report 2017-18 state that since economic growth, in terms of GDP, provides the necessary resources for improving health, education and security, it remains a necessary condition for increases in human welfare (WEF 2017: 1). Second, the authors of the Human Development Report in 1996 state that although average income in countries of the Organisation for Economic Co-operation and Development (OECD) stands at 20,000 USD, surveys point to increasing levels of dissatisfaction. In addition, the authors point out that despite this average income level, many people have an income that is below the poverty line (UNDP 1996: 1, 12). Consequently, there is still an ongoing discussion on appropriate measurements of human welfare and development.

The fact that GDP per capita is relatively easily available in contrast to more holistic indicators (Berg 2012: 61, 65; Nussbaum 2011: 47) and the fact that at least for low-income countries income per capita can make a considerable contribution to economic development, seem to explain their still prevailing dominance as an indicator for human welfare. Bergh (2007: 11-12) acknowledges that increases in income contribute to basic needs at low-income levels and even happiness at higher income levels of countries. Income and human welfare increases are, however, not reliably reflected by GDP increases. The undeterred misinterpretation of GDP as an indicator for human welfare may lead to an information failure and to decisions, such as public policies, that even reduce human welfare. For this reason, Bergh (2007) argues in favour of abolishing the GDP as a measure for human welfare. To put it clearly, countries should pursue increases in economic growth and human welfare. However, first, an adequate measure of human welfare is necessary. Similarly, Berg (2012: 59) states that although there is a general agreement that human welfare is the central objective by which the economic performance of a country should be evaluated, there is still no agreement on the measurement of human welfare.

The link between economic growth and economic development is far from being self-regulating. To make economic development increase among the wide population of a country, resources and opportunities such as basic health service, education and employment need to be provided equitably (UNDP 1996: 66). The UNDP (1996: 74-75) specifies the following determinants as most important for translating economic growth into economic development: equity, priority social spending, income-earning opportunities, access to productive assets, good governance and community action. Providing the wide population with basic health care, education and job opportunities can help to increase their skills and expertise. If a country succeeds in increasing

economic growth and providing economic development to the wide population, economic growth and economic development are likely to result in a positive feedback loop, in a virtuous circle. If a country, however, fails to provide economic development to the population, economic growth and development are likely to result in a vicious circle of decreasing or at least biased economic growth and economic development (UNDP 1996: 79).

2.3 Supply Chain Performance and Economic Development

Does a higher supply chain performance lead to higher economic development? In many reports, logistics and supply chains are often said to make a positive contribution to economic growth and development. The authors of the Connecting to Compete report state that logistics is considered as one of the major contributors to economic development (Arvis et al. 2016: 1). The authors of the Global Competitiveness Report, state that the level of productivity, or in other words competitiveness, is considered the main determinant of economic development (WEF 2017: 11). The authors of the Atlas of Economic Complexity state that improving the manufacturing complexity of a country is a reliable approach to achieve economic development (Hausmann et al. 2013: 66). The relationship between supply chains on the one hand and economic development on the other hand is, however, more complex than these brief statements suggest. A number of macroeconomic studies have analysed the link between transport, trade, logistics and supply chains as well as economic growth and development. For instance, Sachs & Warner (1995) analysed the relation between openness of trade and economic growth of 122 countries between 1970 and 1989 and provided evidence for a positive correlation between openness of trade and economic growth. The authors, however, emphasise that because changes in policies on trade tend to coincide with other factors, changes in policies on trade and other factors may account for increases in economic growth. Similarly, Wacziarg & Welch (2007) analysed the relation between trade liberalisation and economic growth of 133 countries for the period from 1950 to 1998 and found that after countries liberalised their trade regimes, their economic growth increased. This picture is, however, only general as half of the countries of the sample faced no or even negative growth rates. Differences in economic growth after liberalising trade regimes may also stem from a number of differences in other concomitant factors. Frankel & Romer (1999) investigated the relation between the geographical component of trade as well as economic growth of a country, and came to the conclusion that trade leads to increased economic growth.

However, the authors point out that there seem to be additional mechanisms through which geography affects trade and economic growth. A clearly positive statistical relation between trade openness and economic growth could not be established by means of macroeconomic analysis. Hence, a microeconomic analysis of the underlying mechanisms is necessary to establish the link between supply chain performance and economic development.

2.3.1 Exchange of Goods

A first mechanism through which supply chain performance can contribute to economic development is the exchange of goods.

Because of differences in productivity (cf. Ricardo 1817), differences in factor endowments (cf. Heckscher 1919; Ohlin 1933)[9] as well as imperfect competition[10], i.e. oligopolies (cf. Brander & Krugman 1983) and monopolistic competition (Helpman & Krugman 1985) and transport and trade allow a more efficient and effective use of resources and production capacity.[11] Individuals, organisations and countries can benefit from a higher supply of goods, lower costs of goods as well as a larger variety of goods (Broda & Weinstein 2004; Badinger 2007). However, distance between economic locations represents a barrier to transport and trade. Analyses of trade flows suggest that the lower (higher) the distance, the higher (lower) the trade volumes between trade partners (cf. Tinbergen 1962; Linnemann 1966). Especially during the last two centuries, improvements in transport and trade performance allowed for a reduction in transport and trade costs (World Bank 2009a)[12]. Still today, transport costs have a high influence on transport and trade volumes (Berthelon & Freund 2004:

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9   Translated into English in Heckscher & Ohlin, Flam & Flanders (1991 Eds.)

10   This includes economies of scale and product differentiation (cf. Krugman 1979), variety in input goods, technological change and productivity (cf. Grossman & Helpman 1989; Grossman & Helpman 1991; Romer 1986; Aghion & Howitt 1992).

11   The former theories attempt to explain trade between different countries and inter-industry trade. The latter theories laid the theoretical foundation for trade between similar countries and (horizontal and vertical) intra-industry trade. The various theories complement each other in explaining overall trade and location patterns.

12   These include organisational, technological, institutional effectiveness and efficiency improvements in maritime transport, port logistics, road transport, rail transport, air transport, inland waterways, communication, finance and trade (cf. World Bank 2009a: 170-80).

2). Although geographical distance is a good indicator of transport costs, a number of additional factors need to be taken into account to determine overall distance as well as transport and trade costs. Limão & Venables (2001) found that geography only explains 10 percent in variation of transport cost. Djankov & Freund & Pham (2006) found that each day of delay equals an increase in distance of 70 kilometers. Hummels (2001) found that each day of delay of a shipment length of 20 days equals an ad-valorem tariff of 16 percent. Trade costs can be defined as the sum of policy barriers, i.e. tariff and non-tariff barriers, transport costs, i.e. freight and time costs, communication costs as well as additional information costs, enforcement costs, exchange rate costs, legal and regulatory costs as well as local distribution costs (WTO 2008: 81).

One of the factors that co-determines transport costs is transport infrastructure. However, in many developed countries, because of diminishing returns to scale and the high stage of development of transport infrastructure, the justification for additional investment in transport infrastructure is controversially discussed (Bruinsma 1995: 10). Additional investment in transport infrastructure may not only lead to lower marginal returns in transport performance, it may also deter resources from areas, which would provide high marginal returns in transport or economic performance and cause a misallocation of limited financial resources (Rodrigue & Notteboom 2013: 230). In contrast, in many developing countries, the low stage of development of transport infrastructure justifies additional investments in transport infrastructure and is likely to yield considerable improvements in transport performance (Bruinsma 1995: 10). However, the theory of diminshing returns to scale may be limited in applicability if specific constraints restrain the transport infrastructure performance from improving. In such a case, additional investments may lead to further enhancement even if the average infrastructure is well-developed (Bruinsma 1995: 10; Feige 2007: 10-11). Provided that production factors such as transport infrastructure do not run at full capacity, investments in transport infrastructure along with compensation for the workforce always lead to an increase in gross domestic product and thus, is likely to lead to economic development. However, only if these investments create benefits for other factors, and these benefits are compared to other potential investments, can the most efficient and effective use of these resources be determined (Feige 2007: 25, 55).

However, low transport and trade cost are a necessary but not sufficient condition for countries to benefit from transport and trade. Transport and trade may have both positive and negative effects on economic development. Whilst transport may foster economic development, transport may just as well impede economic development (Berg & Lewer 2007: 29-30; Feige 2007: 29; Rodrigue & Notteboom 2013: 230). What is often ignored is the fact that although transportation flows take place at particular gateways, hubs and on corridors, these goods merely move through these locations without much value for this geographical area. These areas only serve as transmitters or destinations for consumption (Hall & Jacobs & Koster 2011: 81). Arriving imports may also prevent the establishing of a domestic production industry (Kaplinsky & Morris 2009; Kamau & McCormick & Pinaud 2009). Boarnet (1996) investigated how investment in transport infrastructure affects locations and concluded: Investments in transport infrastructure may have direct as well as indirect effects. Direct effects affect the geographic area where the investment is made; indirect effects affect the geographic areas outside of where the investment is made. The indirect effects may be positive or negative. For instance, spillover effects may occur or on the contrary, companies may relocate from the area out- to inside. Depending on the size of impacts, positive and negative impacts may balance each other.

In contrast to free transport and trade, countries may decide to strictly protect their economies and attempt to build up their own sources of supply. Albeit controversial, under specific conditions and circumstances, import substitution may be reasonable (Meier 1988: 22-23). After the Second World War, many developing countries pursued an import-substitution industrialisation strategy. In contrast, developing countries that did not embark on an import-substitution industrialisation strategy but pursued a more liberal trade regime experienced higher growth rates. Import substitution industrialisation strategies eventually reduced economic growth. An import-substitution industrialisation strategy along with high costs of domestic production may, in the worst case, lead to unavailability of goods on the domestic market. In addition, it may pull resources away from industries with a comparative advantage (Krueger 1998: 1513).

2.3.2 Exchange of Knowledge

A second mechanism through which supply chain performance can contribute to economic development is the transmission of knowledge, which may incentivise higher productivity in existing industries and the emergence of new industries.

For the period of 1870 to 2004, Madsen (2007) analysed the relationship between imports of technology and total factor productivity of 16 OECD countries and concluded that imports of knowledge are important determinants of total factor productivity. Thus, international trade serves as an important carrier for the spread of technologies. These findings suggest that new technologies lead to productivity increases and thereby to economic growth. Similarly, Coe & Helpman (1995) analysed the relationship between research and development capital stock and total factor productivity of 22 countries in the period from 1971 to 1990. They found a positive correlation between the two variables, both for domestic as well as foreign research and development expenditures. Moreover, they found that a higher effect of foreign research and development on domestic productivity goes along with higher openness to trade, i.e. imports, of a country. Coe & Helpman & Hoffmaister (1995) analysed the relationship between total factor productivity of 77 developing countries and foreign research and development capital stock of developed trading partner countries for the same period. Likewise, they found that foreign research and development capital stock is positively correlated with total factor productivity of the deleloping countries and that a higher effect of foreign research and development on domestic productivity goes along with higher openness to trade of the developing country.

Acemoglu & Robinson (2012: 48-69) analysed a number of theories that intend to explain differences in the level of economic development of countries, such as geography, climate and culture. By doing so, Acemoglu & Robinson (2012: 51-54) observe that differences in the level of economic development often go along with differences in the level of adoption of modern technologies. The adoption of technologies such as steam power, mechanisation, electricity or factory production with its effects on transportation and production allows countries to increase economic productivity and output (Acemoglu & Robinson 2012: 53, 77, 84). They conclude that adoption of modern technology through trade is an important means to increase productivity and, eventually economic growth and development. It is important to emphasise here that the

authors regard trade and the adoption of modern technologies as a means but not as the root cause of economic development. Rather, differences in political and economic institutions[13] represent the root cause for differences in economic development.

The authors of the Atlas of Economic Complexity have studied the relationship between the economic complexity of an economy – reflected in its export structure – and the economic wealth of an economy. Hausmann et al. (2013: 27-30) assumed that if a country exports specific goods, it holds the necessary capabilities to produce and export those goods. They found a strong correlation between economic complexity and the economic wealth of countries. Therefrom, they conclude that economic complexity is a major driver of economic wealth of an economy.

In addition to these direct spillover effects, Lumenga-Neso & Olarreaga & Schiff (2005) found that even if two countries do not trade with each other, but only through a third country, the importing country benefits from indirect spillover effects.

2.3.3 Local Value-add and Integration into Value Networks

A third mechanism through which supply chain performance can contribute to economic development is local value-add and integration of countries into international value networks.

Location theory predicts that companies and industries tend to set up locations based on a number of considerations. First, natural resources provide companies and industries proximate access to raw materials. The availability of natural resources was particularly important during the Industrial Revolution. Natural resources do not, however, explain the location of less natural-resource dependent industries in natural resource abundant locations. Human actions and their outcome provide resources for other less natural-resource-dependent industries. Second, because of increasing returns to

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13   Throughout this work, the term institutions is used to denote "(…) the humanly devised constraints that structure political, economic and social interaction. They consist of both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights)" (North 1991: 97). Based thereon, Durth & Körner & Michaelowa (2002: 214-215) distinguish between formal and informal institutions. Similarly, Voigt (2009: 31) distinguishes between internal and external institutions. The WEF (2017: 322) divides public and private institutions, as will become visible a little later. North (1991: 98) points out that "[b]oth political and economic institutions are essential parts of an effective institutional matrix".

scale in production as well as transport costs, there is a trade-off (Ottaviano & Thisse 2003: 2, 6). It should only be mentioned in passing that some goods, such as mineral resources, show a lower transport distance to volume elasticity than other goods, such as manufactured goods (Berthelon & Freund 2004: 18). High economies of scale militate in favour of a concentration of production activities. Industries tend to concentrate their activities in locations where they already have a large market and export to smaller markets. High transport costs militate in favour of a deconcentrating of production activities (Krugman 1980: 955; Krugman 1991a). Since the 1970s, a reduction in transport and transaction cost allowed for fragmentation and specialisation of production activities (Feenstra 1998: 32-34; Jones & Kierzkowski 2001). The more specialised and fragmented manufacturing processes become, the more trade in intermediate goods is necessary. The high transport and trade intensity requires well performing transport services. Well performing logistics processes are a prerequisite for being part of highly fragmented and multinational value chains (Saslavsky & Shepherd 2012: 2). The authors of the Connecting to Compete report state that well performing logistics processes are a necessary condition for countries to join international value networks. In addition to costs and time, timeliness and reliability are of high importance to companies and locations in international networks. Strategies, plans and actions, such as express shipments, higher inventories, and multiple sourcing measures, may to some extent counterbalance disruptions. However, such actions increase the costs of a location and reduce its cost-competitiveness (Arvis & Raballand & Marteau 2010: 41). Small changes in logistics performance can considerably change the competitiveness of companies (Arvis et al. 2007: 16). Locations and countries, which do not provide the necessary supply chain performance will be increasingly decoupled from international value networks (Arvis et al. 2016: 23, 24, 25). Consequently, insufficient logistics and supply chain performance can keep supply chains away from locations, regions and countries. In turn, countries cannot reap the potential benefits from local supply chains (Memedovic & Ojala & Rodrigue 2008: 359). An adequate logistics and supply chain performance provides a country with the prerequisites to participate in today's fragmented and multinational supply chains.

Wagner (2007) analysed the relationship of export activities and productivity of companies, and concluded that companies that engaged in export generally have a higher productivity than companies that are not engaged in export. Their productivity premium could be due to two facts. First, doing business in foreign markets is accompanied with additional costs, which raise the bar for market entries and existence. In

order to enter or continue to exist in a more competitive market requires a company to continuously increase its performance in foreign markets. As a side effect, this could lead to an increase of a company's performance in the home market. Second, the need to keep up with the level of performance in foreign markets leads to a comparison and collaboration with competitors, customers and suppliers. This in turn is accompanied by positive effects on the performance in the home market. By contrast, Bernard & Jensen (1999) did not find empirical evidence that exporting leads to higher productivitiy. Rather, they concluded that high performance leads to exporting. Although they could not identify benefits of exporting with regard to productivity, they state that exporting provides a company with a larger market, exporting shifts economic resources to more productive sectors and it may lead to job opportunities.

Bernard & Jensen & Schott (2003) examined the relation between changes in tariff and transport costs as well as plants and concluded that falling trade costs cause a reallocation of activites to high productivity and export plants. In low productivity and non-export-oriented production sites, decreasing trade costs may render these production sites non-competitive, while in high productivity and export-oriented production sites, decreasing trade costs will allow those production sites to expand their markets, increase their sales and be more productive. In other words, more efficient organisations will gain market share at the expense of the less efficient organisations.

2.3.4 External Economies and Economic Agglomeration

A fourth mechanism through which supply chain performance can contribute to economic development is the facilitation of external economies and economic agglomeration.

Increased economic agglomeration is likely to reinforce economic agglomeration. As early as 1920, Marshall (1920: IV.X.7, 8, 9) gave three reasons for this: Firstly, economic agglomeration provides external economies such as knowledge sharing and spillover effects. Secondly, economic agglomeration allows high specialisation in supply and demand of goods and services. Thirdly, a larger and more stable market for supply and demand of specialised skills leads to a further strengthening of economic agglomeration. Hirschman (1958: 100, 104) explains that whilst local economic activity creates a demand for input goods and, thus, leads to backward linkages, local

economic activity also creates incentives to make use of output goods and, thereby, can lead to forward linkages. The individual industries' backward and forward linkages in combination have a cumulative effect on further economic activity. Krugman (Krugman 1991a; 1991b: 36 et seqq.) seized Marshall's and Hirschman's considerations of industry location to the new economic geography.

Schmitz (1999: 469-471) distinguishes between, on the one hand, external economies that occur intendedly by taking actions that lead to direct benefits for an organisation and, on the other hand, those that occur unintendedly by taking actions whose benefits cannot be directly internalised by an organisation but rather spread to many organisations. These collective benefits may not occur automatically; often, decisive actions are necessary to lead to benefits for many organisations. Schmitz (1999: 470) refers to planned and unplanned collective efficiency.

This phenomenon of external economies is precisely what leads, at an advanced stage, to a so-called cluster. A cluster can be defined as a geographical accumulation of related business units, associations and public and private organisations in a certain field (Krugman 1991b: 35-67; Porter 1998: 78). The characteristic of geographic concentration is what distinguishes a cluster from a network (Langen 2002: 210). Clusters benefit from better access to employees and suppliers, access to specialised information, complementation e.g. in products, services and coordination, access to organisations and public goods, better motivation and measurement, higher ability to innovate as well as a higher rate of foundations of enterprises (Porter 1998: 81-84). A cluster is driven by mutual competition among organisations as well as vertical and horizontal cooperation (Langen 2002: 212). Even though several economic agglomerations are often far from being legitimately declared as a cluster, increasing economic agglomeration along with the emergence of cluster benefits is desirable for members within that geographic area and economic field. Especially innovative activities are characterized by economic agglomeration or clustering effects, as they take place in locations with high knowledge sharing and spill-over effects. Innovative activities are even more concentrated than production activity itself (Feige 2007: 52). Schmitz (1999: 478) points out that clusters allow companies to split up large, risky investments into small and riskable investments and, thus, allow companies, especically small companies, to continuously develop. Since clusters provide a number of location factors, constraints to company development are less severe in clusters.

The concept of clusters can also be found in the logistics industry. Logistics clusters offer three major benefits: First, logistics do not only represent or depend on a single industry and are therefore less susceptible to economic structural changes. Second, logistics do not serve only a single industry but rather constitute some kind of essential enabler and, in part indispensable, supporter for a huge range of industries. Third, logistics can only partly be outsourced to foreign geographical areas and necessitate local economic activity. These three reasons can, according to Sheffi (2012: 53, 54), make logistics clusters a promising contributor to economic development.

Despite a number of arguments for a positive contribution of economic agglomerations to economic development, there are also concerns. Negative effects of economic agglomeration, such as bottlenecks, congestion, inertia, inflexibility, inefficiencies and severe environmental (air, water, noise, land) pollution may outweigh gains from economic agglomeration and, eventually decrease economic development. Increasing economic agglomeration often entails a trade-off between gains from agglomeration and losses from negative side effects (Porter 1998: 86; Desmet & Fafchamps 2003: 18, Feige 2007: 53). Provided that agglomeration and cluster effects do not entail unreasonable negative effects they can contribute to supply chain performance as well as economic development (Rodrigue & Notteboom 2013: 235-236).

Mangan & Lalwani & Fynes (2008: 36) state that seaports offer the opportunity to locate value-added logistics and further value-added activities near a seaport. The agglomeration of maritime advanced producer services is often related to the evolution and existence of finance, insurance, legal activities, maritime institutes, government functions and trade associations. Hall & Jacobs & Koster (2011: 85, 97) plead, however, that a clear correlation between volume of cargo and agglomeration of transport-related higher order activities (e.g. insurance, maritime law, classification, finance, insurance brokerage, cargo and vessel surveying, consultancy) does not necessarily exist. Of course, transport-related routine basic and advanced activities (e.g. chandlers, brokers, freight forwarders) take place depending on the volume of cargo, but there is not necessarily a need to go beyond routine activities.

Further economic agglomeration and cooperation between local companies often attract foreign direct investment (FDI). For instance, a seaport may decisive for locating an export-oriented manufacturing facility (Mangan & Cunningham 2000; Bryan & Munday & Pickernell 2006: 373). An essential argument to note here is that FDI not only brings a certain amount of economic activity, capital and jobs; it usually also leads to a continuous transfer of human technology[14], from abroad (UNDP 1996: 78). Diffusion of human technology in principle is slow and tends to settle down where initially developed. However, knowledge sharing and spill-over effects can improve reach and speed of diffusion (Berg & Lewer 2007: 120). More capital, jobs and human technology diffusion are likely to trigger further accumulation. Moreover, the availability of internalised human technology is what makes the transfer of further human technology at all possible (Berg 2012: 297).

The above outlined mechanisms can eventually be boiled down to a major indirect mechanism between supply chain performance and economic development – the creation and preservation of employment and income opportunities (Bryan & Munday & Pickernell 2006: 373). Regarding seaports, however, Mangan & Lalwani & Fynes (2008: 32) and Suykens & Voorde (1998: 254) point out that the direct job effects become less relevant as more and more technological and organisational developments find their way into seaport administration and operations and substitute capital for labour. At the same time, Bryan & Munday & Pickernell (2006: 371, 379, 384) argue that the direct employment figures of seaports are an insufficient indicator for drawing conclusions on the importance of seaports for regional economic development. Seaports create demands for regionally produced goods and services, which in turn leads to output in goods and services as well as local employment. This again creates a demand for goods and services. The resulting multiplier effects are what make these cause and effect relations important for regional economic development.

Consequently, as can be seen from this outline of the link between supply chains and economic development, through various mechanisms supply chain performance can contribute to economic growth and development. A major potential effect is, of course, job opportunities and related income opportunities. Job opportunities and related income contribute at least to basic or physiological human needs. Along with other effects such as exchange of goods and knowledge, they may also contribute to higher (in terms of Maslow's pyramid) needs such as self-esteem and self-actualisation.

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14   i.e. knowledge, techniques, methods, procedures and culture (Berg 2012: 285)

Therefore, generally speaking, from a national economic point of view it is worth fostering supply chain performance. However, two central points need to be borne in mind: First, like in the case of trade, depending on the specific design of supply chains, supply chain performance may have both positive and negative effects on economic development. Second, whether economic growth adequately translates into economic development rests upon the set and design of institutions of a country (cf. WEF 2017: 7). This section closes with these positive, but at the same time cautious notes and then moves on to look in detail at measuring approaches of supply chain performance.

2.4 Supply Chain Performance Measurement

Because a multitude of factors determine supply chain performance, developing a procedure to measure and identify constraints of supply chain performance poses a challenge (cf. Comtois & Slack 2011: 101-102; Arvis et al. 2016: 55; Suykens & Voorde 1998: 255, 256; Woo & Pettit & Beresford 2013: 239). There is already a plethora of benchmarking approaches and reports on individual components of supply chain peformance. These approaches and reports have been designed to provide the private and public sector with entry points and justification for actions of improvements (cf. Arvis et al. 2016: 1; WEF 2017: 18; World Bank 2018a: 14). Because benchmarkings provide information on the position of a country in relation to other countries and thereby indicate what can generally be achieved, they help to put these topics on the public agenda, put them up for discussion and provide the foundation for actions of improvement. If accurately applied, benchmarkings may provide value (Hausmann & Klinger & Wagner 2008: 12). It seems reasonable to review the existing approaches with regard to their applicability to the research questions of this work.

Before analysing a number of selected benchmarks, some notes on the choice of cross-country benchmarks seem worthwhile. On the one hand, because the private sector often operates logistics and manufacturing chains, supply chain performance is a matter of interest of the private sector. On the other hand, first, because the public sector provides a wealth of hard and soft infrastructure and, second, as indicated earlier, because the public sector often tries to take advantage of supply chains in

order to achieve national economic development objectives, supply chain performance is a matter of interest of the public sector.[15]. It should only be mentioned in passing at this stage that the various objectives do not necessarily go in line (cf. Arvis et al. 2016: 3, 5, 27; AfDB 2010: 77-78.). For these reasons, supply chain performance is a matter of interest of both the private sector and the public sector. Therefore, this research takes on a comprehensive identification approach and considers improvement measures from a private, public as well as public-private sector point of view.

To get an insight into the design of benchmarks on supply chain performance as well as to provide a basis for the country analysis in chapter four and five, the methodology of major benchmarking approaches and reports is reviewed. There are different types of benchmarking approaches of domains of supply chain performance.

There are benchmarking approaches that put the efficiency compoment of supply chain performance at the centre of analysis. These include the Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA) (Cullinane & Wang 2006: 20). The SFA is a parametric computational model that calculates multiple input – single output ratios (Farrell 1957; Liu 1995; Coto-Millan & Banos-Pino & Rodriguez-Alvarez 2000; Cullinane & Song 2003). DEA is a non-parametric computational method that calculates multiple input – multiple output ratios of so-called decision units, such a components of supply chains (Charnes & Cooper & Rhodes 1978; Roll & Hayuth 1993; Martinez-Budría et al. 1999). Both methods provide efficiency figures for benchmarking. Despite a number of advantages, a major disadvantage of these methods is that they focus on the efficiency component of performance but are not able to capture the effectiveness component of performance adequately. A major advantage of the DEA is that irrespective of the relation between input and out variables, the method is able to calculate efficiency ratios. However, this advantage turns into a major disadvantage, since various context differences among instances of supply chains may make drawing meaningful comparisions a challenge. The DEA is not able to identify

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15   For instance, Suykens & Voorde (1998: 254-257) shed light on the role of ports as
      public goods and means of public intervention. Schmitz & Nadvi (1999: 1509-10) set
      out the role of the public sector in supporting clusters. Grossman & Helpman (2002)
      as well as Nunn (2007) stress the importance of public institutions in FDI decisions.
      Hausmann & Rodrik (2003: 629) emphasise the importance of governments is sup-
      porting the self-discovery of private sector economic activity. Lin & Monga (2010: 3-
      16) emphasise the role of governments in structuring and facilitating economic growth
      and development.

mechanisms and causes behind differences in efficiency ratios (Barros 2003: 67; Barros & Athanassiou 2004: 135; Wang & Cullinane 2006: 96). Because of these two major disadvantages, such efficiency-focussed benchmarking approaches are not suited to measure supply chain performance holistically and to identify constraints.

This research takes the view that efficiency and effectiveness components need to be considered in order to identify binding constraints of supply chain performance. For this reason, this research concentrates on comprehensive benchmarking approaches. Comprehensive approaches are expected to be represented by a number of benchmarking report series, namely World Bank Doing Business, World Bank Connecting to Compete, the Massachusetts Institute of Technology and Center for International Development at Harvard University Atlas of Economic Complexity, the World Economic Forum Global Competitiveness Report as well as the World Bank Worldwide Governance Indicators. These six approaches and reports are reviewed hereinafter.

2.4.1 Connecting to Compete

Since 2007, a major source of information concerning logistics performance comparisons at a cross-country level is the World Bank Connecting to Compete – Trade Logistics in the Global Economy report. The report gathers, contrasts and evaluates information on logistics performance in about 160 countries. At the core of the Connecting to Compete report is the Logistics Performance Index (LPI) and its components. The report is updated every two years and is now, at the date of finalisation of this work, available in its fifth edition, the "Connecting to Compete 2016" (Arvis et al. 2016: iii).

The LPI is a composite indicator, consisting of six weighted components. Whilst customs, infrastructure and service quality serve to reflect input and areas for public regulation, international shipments, tracking and tracing as well as timeliness serve to reflect outputs and areas of supply chain performance (Arvis et al. 2016: 6). The World Bank computes an overall LPI score as well as scores for each international component. These six LPI components are depicted in Table 2-1 below.

The information of the Connecting to Compete stems from freight forwarders and express carriers. Arvis et al. (2016: 6) state that their opinion matters because freight forwarders and express carrriers decide on gateways and routes and thereby directly affect markets situations.

The international LPI expresses logistics performance in countries from a foreign trading partner's point of view. The domestic LPI expresses logistics performance in countries from local logistics professional's point of view (Arvis et al. 2016: 17).

Table 2-1: International LPI Components

International LPI Components	
Customs	Efficiency of customs and border management, i.e. speed, simplicity and predictability or formalities by border control agencies, including customs
Infrastructure	Quality of trade and transport infrastructure, e.g. ports, railroads, roads, information technology
International shipments	Ease of arranging competitively priced shipments
Service quality	Competence and quality of logistics services, e.g. transport operators, customs brokers
Tracking and tracing	Ability to track and trace consignments
Timeliness	Frequency with which shipments reach consignees within scheduled or expected delivery times

Source: based on Arvis et al. 2012: 1; Arvis et al. 2016: 6

The domestic LPI is split up into the environment and institutions as well as the performance part, as depicted in Table 2-2 below. The international LPI is closely linked to the domestic LPI, since international logistics performance eventually depends on domestic logistics performance (Arvis et al. 2012: 1).

The authors indicate that depending on their supply chain performance, countries assign different priorities to components and improvement measures. Whilst countries at a low level of performance tend to assign priorities to basic supply chain components and measures, such as infrastructure improvements, countries at a higher level of performance tend to assign priorities to advanced components and measures, such as operational or regulatory improvements (Arvis et al. 2016: 12).

Table 2-2: Domestic LPI Components

Domestic LPI Components - Environment and Institutions	
Level of fees and charges	Port charges
	Airport charges
	Road transport rates
	Rail transport rates
	Warehousing / transloading charges
	Agent fees
Quality of infrastructure	Ports
	Airports
	Roads
	Rail
	Warehousing / transloading facilities
	Telecommunications and IT
Quality and competence of service	Road
	Rail
	Air transport
	Maritime transport
	Warehousing / transloading and distribution
	Freight forwarders
	Customs agencies
	Quality / standards inspection agencies
	Health / SPS agencies
	Customs brokers
	Trade and transport associations
	Consignees or shippers
Efficiency of processes	Clearance and delivery of imports
	Clearance and delivery of exports
	Transparency of customs clearance
	Transparency of other border agencies
	Provision of adequate and timely information on regulatory changes
	Expedited customs clearance for traders with high compliance levels
Sources of major delays	Compulsory warehousing / transloading
	Pre-shipment inspection
	Maritime transshipment
	Criminal activities (e.g. stolen cargo)
	Solicitation of informal payments
Changes in the logistics environment	Customs clearance procedures
	Other official clearance procedures
	Trade and transport infrastructure
	Telecommunications and IT infrastructure
	Private logistics services
	Regulation related to logistics
	Solicitation of informal payments
Domestic LPI Components - Performance	
Export time and cost / Port or airport supply chain	Distance (kilometres)
	Lead time (days)
	Cost (US$)
Export time and cost / Land supply chain	Distance (kilometres)
	Lead time (days)
	Cost (US$)
Import time and cost / Port or airport supply chain	Distance (kilometres)
	Lead time (days)
	Cost (US$)
Import time and cost / Land supply chain	Distance (kilometres)
	Lead time (days)
	Cost (US$)
Shipments meeting quality criteria	Percentage
Number of agencies - exports	Number of forms
Number of agencies - imports	Number of forms
Number of documents - exports	Number of forms
Number of documents - imports	Number of forms
Clearance time without physical inspection	Days
Clearance time with physical inspection	Days
Physical inspection	Percentage
Multiple inspection	Percentage

Source: based on Arvis et al. 2016: 42-48

When using the Connecting to Compete report, it is necessary to understand its strengths, weaknesses and limitations:

First, the overall LPI score and its components should not be regarded as precise values, which exactly reflect the state of logistics performance of a single country in an isolated view. The scores should rather be regarded as approximate indicators of a country's logistics performance as part of a large set of countries. The scores provide information on the location of a single country against the background of a larger set, that is, whether it is located among the best, middle or worst performers (Arvis et al. 2016: 7). Second, since its inauguration in 2007 the focus of the LPI is on border components of logistics performance. The international LPI measures logistics performance at main international gateways, but does not measure performance throughout the country. However, logistics performance may not be equally distributed nationwide. For large and diverse countries, the international LPI scores may therefore not perfectly reflect a country's overall logistics performance (Arvis et al. 2016: 5, 7, 16, 29). Third, in landlocked countries, the LPI may not adequately capture issues that stem from outside the country assessed, such as transit regulation. Landlocked countries may suffer from issues outside their area of control (Arvis et al. 2016: 7). Fourth, although the logistics performance index focusses on factors that are in the area of control of a country, i.e. endogenous factors, there are exogenous factors, such as geography, that may influence a country's logistics performance rating (Arvis et al. 2016: 22). Fifth, the LPI is designed as an indicator for international comparisons of logistics performance of countries and its emphasis is on cross-case and quantitative research. For this reason, it does not provide in-depth country analysis. The LPI could be very well supplemented with in-depth country case studies. This could bring researchers to explore a country's state of logistics performance more intensively (Arvis et al. 2012: iii; 2016: 5, 30).

2.4.2 Doing Business

Since 2003, a major source of information concerning the regulation and regulatory process performance as well as their implications for administration and operations of companies at a cross-country level is the World Bank Doing Business report. The report gathers, contrasts and evaluates information on the regulations and regulatory processes to set up and operate businesses in about 190 countries. At the core of the World Bank Doing Business report is the Ease of Doing Business indicator. The report

is updated every year and is now, at the date of finalisation of this work, available in its 15th edition, the "Doing Business 2018" (World Bank 2018a: 1).

The Ease of Doing Business indicator is composed of 11 indicator sets and 41 indicators, as depicted in Table 2-3 below. For the Ease of Doing Business indicator as well as for 10 indicator sets, country ranks and the best practice distance to frontier values are provided.[16] The rank reflects a country's rank among the entirety of all covered countries. The distance to frontier reflects a country's performance compared with the best performance across countries. Higher distance to frontier (dft) scores reflect a higher performance; a dft score of 0 represents the lowest performance and a dft score of 100 the best performance across countries (World Bank 2018a: 5). The Doing Business information stems from professionals who routinely administer, advise on or process legal and regulatory frameworks and transactions. In order to gain as wide as possible unbiased and up-to-date information, professionals, who only infrequently or superficially deal with these issues are not taken into account (World Bank 2018a: 17).

In Doing Business 2015 and 2016, the World Bank has increased the share of effectiveness-focussed indicators, compared to efficiency-focussed indicators. The World Bank states that an increase in efficiency is of little value if the effectiveness, e.g. the quality of a service, is insufficient. The aim should be to provide both the right as well as well-carried out regulation (World Bank 2016: 27-28). This statement goes in line with the preceding remarks (cf. section 2.1 and 2.4.) on the importance of an efficiency and effectiveness component in supply chain performance measurement.

The World Bank (2018: 12) emphasises that countries that rank highest and score best on Doing Business indicators are not those that have no regulation but rather those that are able to regulate their markets adequately without inappropriate burden.[17] To do so, the public sector needs to provide a sound business regulation.[18]

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16   Doing Business does not provide ranking and distance to frontier values for labour market regulation (World Bank 2018a: 11).

17   The World Bank (2013: 2, 21) emphasises that Doing Business does by no means suggest eliminating the role of the public sector in private sector business; rather they point out that the public sector has an important role to play in providing an effective and at the same time efficient regulation and, thereby, allow the private sector to strive.

18   "Sound business regulation requires both efficient procedures and strong institutions that establish transparent and enforceable rules" (World Bank 2013: 2).

Table 2-3: Doing Business Components

Doing Business Components	
Starting a business	Procedures, time, cost and paid-in minimum capital to start a limited liability company
Dealing with construction permits	Procedures, time and cost to complete all formalities to build a warehouse and the quality control and safety mechanisms in the construction permitting system
Getting electricity	Procedures, time and cost to get connected to the electrical grid, the reliability of the electricity supply and the transparency of tariffs
Registering property	Procedures, time and cost to transfer a property and the quality of the land administration system
Getting credit	Movable collateral laws and credit information systems
Protecting minority investors	Minority shareholders' rights in related-party transactions and in corporate governance
Paying taxes	Payments, time and total tax and contribution rate for a firm to comply with all tax regulations as well as post-filing processes
Trading across borders	Time and cost to export the product of comparative advantage and import auto parts
Enforcing contracts	Time and cost to resolve a commercial dispute and the quality of judicial processes
Resolving insolvency	Time, cost, outcome and recovery rate for a commercial insolvency and the strength of the legal framework for insolvency
Labour market regulation	Flexibility in employment regulation and aspects of job quality

Source: based on World Bank 2018a: 12

When using the Doing Business report, it is necessary to understand its strengths, weaknesses and limitations (World Bank 2018a: 13-14):

First, the Doing Business report strives to map the regulatory framework of as many countries as possible. Comparability is a major request. This, however, implies that the envisioned data must be available for each country. The choice of indicators is therefore aligned to what data can be obtained across all included countries. Due to the lack of data, some countries have been excluded. Second, although Doing Business covers many indicators of the regulatory framework, many important indicators are not covered. The authors emphasise that the indicator set only covers a narrow band of the entire range of conceivable indicators. For instance, the macroeconomic

stability, state of the financial system, level of training and skills of the labour force, prevalence of bribery and corruption, market size and security have not been taken into account. Likewise, the report does not explicitly explore the role of seaports, roads and railways as well as communication systems in providing a business-friendly regulatory environment. Thus, Doing Business serves as a starting point and should be complemented with further sources of information. Third, the World Bank highlights that although Doing Business strives to represent a country's state of regulatory performance, there is a within-country variation. Particularly large countries or countries divided into federal states show within-country variation. The Doing Business report attempts to account for within-country variation by providing sub-national doing business case studies (World Bank 2018a: 13-14). Finally, the World Bank states that although Doing Business only considers indicators that can be influenced by an economy not every change in an indicator promises the same value to an economy. Thus, not every influenceable indicator is worth changing. It is the duty of policy makers to decide, which actions to go about and to decide on the necessary trade-offs (World Bank 2015: 18).

Doing Business is not only an immediate source of information for policy makers; Doing Business is also used as input information for the construction of other composite measures. For instance, indicators of Doing Business provide input information for the construction of a measure, which will be described in the next section – the World Economic Forum Global Competitiveness Report (World Bank 2018a: 21).

2.4.3 Global Competitiveness Report

Since 1979, a major source of information on the level of productivity or, in other words, competitivenss[19] at a cross-country level is the World Economic Forum Global Competitiveness Report. The report gathers, contrasts and evaluates information on the factors that are expected to determine the competitiveness of a country in about 140 countries. Since 2005, the Global Competitiveness Index (GCI) is at the core of the Global Competiveness Report. The Global Competitiveness Report is now, at the

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19   The authors of the Global Competitiveness Report "(…) define competitiveness as the set of institutions, policies, and factors that determine the level of productivity of an economy, which in turn sets the level of prosperity that the economy can achieve" (WEF 2017: 11).

date of finalisation of this work, available in its 15th edition, the Global Competitiveness Report 2017-2018 (WEF 2017: 11).

The Global Competitiveness Report covers 12 components or so-called pillars and more than 100 indicators, as depicted in Table 2-4 below (WEF 2017: 11). Although the 12 pillars are clearly distinguished from each other, they are not independent from each other. In the first instance, they complement each other and additionally strengthen or weaken each other (WEF 2014: 9).

Since economies have different needs depending on their current stage of development, the pillars are not equally important to all economies. Institutions, infrastructure, macroeconomic environment as well as health and primary education are considered as basic requirements. These are expected to be most important to a factor-driven economy. Higher education and training, goods market efficiency, labour market efficiency, financial market development, technological readiness and market size are considered as efficiency enhancers. Those are expected to be most important to an efficiency-driven economy. Business sophistication and innovation are considered as innovation and sophistication factors. These are expected to be most important to an innovation-driven economy. The basic requirements, efficiency enhancers as well as innovation represent sub-indices of the Global Competitiveness Index. Depending on the stage of development of an economy, each weighted subindex contributes to the overall index, the Global Competitiveness Index of a country (WEF 2017: 319-321).

For each country, subindex and pillar, international ranks as well as scores on a scale of one to seven, where seven is most desirable, are calculated. In addition, the Global Competitiveness Report provides information on the most problematic factors of doing business in a country (WEF 2017: 39-40).

The Global Competitiveness Report information stems from various national authorities, international agencies, private sources, as well as in the case of unreliable, unavailable or outdated data, from the Executive Opinion Survey of the World Economic Forum. The WEF Executive Opinion Survey captures attitude data of business executives worldwide on various topics related to competitiveness (WEF 2014: 11, WEF 2018: 333, 341).

Table 2-4: Global Competitiveness Components

Global Competitiveness Components			
1st pillar: Institutions			
Public institutions			
		Property rights	Property rights, intellectual property projection
		Ethics and corruption	Diversion of public funds; public trust in politicians; irregular payments and bribes
		Undue influence	Judicial independence; favouritism in decisions of government officials
		Public-sector performance	Wastefulness of government spending; burden of government regulation; efficiency of legal framework in settling disputes; efficiency of legal framework in challenging regulations; transparency of government policymaking
		Security	Business costs of terrorism; business costs of crime and violence; organised crime; reliability of police services
Private institutions			
		Corporate ethics	Ethical behaviour of firms
		Accountability	Strength of auditing and reporting standards; efficacy of corporate boards; protection of minority shareholders' interests; strength of investor protection
2nd pillar: Infrastructure			
Transport infrastructure			Quality of overall infrastructure; quality of roads; quality of railroad; infrastructure; quality of port infrastructure; quality of air transport infrastructure; available airline seat kilometres
Electricity and telephony infrastructure			Quality of electricity supply; mobile telephone subscriptions; fixed telephone lines
3rd pillar: Macroeconomic environment			Government budget balance; gross national savings; inflation; government debt; country credit rating
4th pillar: Health and primary education			
Health			Business impact of malaria; malaria incidence; business impact of tuberculosis; tuberculosis incidence; business impact of HIV / AIDS; HIV prevalence; infant mortality; life expectancy
Primary education			Quality of primary education; primary education enrollment rate
5th pillar: Higher education and training			
Quantity of education			Secondary education enrollment rate; tertiary education enrollment rate
Quality of education			Quality of the educational system; quality of math and science education; quality of management schools; internet access in schools
On-the-job training			Local availability of specialised research and training services; extent of staff training
6th pillar: Goods market efficiency			
Competition			
		Domestic competition	Intensity of local competition; extent of market dominance; effectiveness of anti-monopoly policy; effect of taxation on incentives to invest; total tax rate; number of procedures required to start a business; time required to start a business; agricultural policy costs
		Foreign competition	Prevalence of trade barriers; trade tariffs; prevalence of foreign ownership; business impact of rules on FDI; burden of customs procedures; imports as a percentage of GDP
		Quality of demand conditions	Degree of customer orientation; buyer sophistication
7th pillar: Labour market efficiency			
Flexibility			Cooperation in labour-employer relations; flexibility of wage determination; hiring and firing practices; redundancy costs; effect of taxation on incentives to work
Efficient use of talent			Pay and productivity; reliance on professional management; country capacity to retain talent; country capacity to attract talent; female participation in labour force
8th pillar: Financial market development			
Efficiency			Financial services meeting business needs; affordability of financial services; financing through local equity market; ease of access to loans; venture capital availability
Trustworthiness and confidence			Soundness of banks; regulation of securities exchanges; legal rights index
9th pillar: Technological readiness			
Technological adoption			Availability of latest technologies; firm-level technology absorption; FDI and technology transfer
ICT use			Internet users; broadband Internet subscriptions; internet bandwidth; mobile broadband subscriptions; mobile telephone subscriptions; fixed telephone lines
10th pillar: Market size			
Domestic market size			Domestic market size index
Foreign market size			Foreign market size index
11th pillar: Business sophistication			Local supplier quantity; local supplier quality; state of cluster development; nature of competitive advantage; value chain breadth; control of international distribution; production process sophistication; extent of marketing; willingness to delegate authority; reliance on professional management
12th pillar: R&D Innovation			Capacity for innovation; quality of scientific research institutions; company spending on R&D; university-industry collaboration in R&D; government procurement of advanced technology products; availability of scientists and engineers; PCT patent applications; intellectual property protection

Source: based on WEF 2017: 341-350

When using the Global Competitiveness Report, it is necessary to understand its strengths, weaknesses and limitations:

First, the set of indicators aims to provide the public and private sector with information on where to set their priorities. The set of indicators represents a starting point to identify the most binding constraints of a country. The GCI is, however, only a starting point of an in-depth analysis (WEF 2017: 18, 21). Second, in 2014, the World Economic Forum started to review and revise the current methodology of the Global Competitiveness Index in order to make allowance for new factors that shape the competitiveness of countries as well as the latest state of knowledge. The 12 pillars will be reorganised, some pillar concepts, definitions and indicators will be refined, newly introduced or deleted. Instead of different weights of the pillars in the sub-indices depending on a country's stage of development, each pillar will receive the same weight and the stages of development will not be continued. Consequently, the current GCI will not be comparable with the future GCI (WEF 2017: 353-354).

2.4.4 Atlas of Economic Complexity

Since 2011, the Atlas of Economic Complexity – Mapping Paths to Prosperity attempts to provide information on the knowledge that an economy holds. Based thereon the Atlas pinpoints to proximate paths for further economic diversification. The report provides information on about 128 countries. The report is now, at the date of finalisation of this work, available in its second 2013 edition (Hausmann et al. 2013). The Atlas Online, provides up to date information (CID at Harvard University 2017).

The report is based on the notion that the current explicit and tacit knowledge of an economy – reflected in its entirety of capabilities – determines what the economy is able to produce today as well as in the future.[20] The report regards capabilities as inputs and products as outputs. Each product requires a specific set of capabilities. The same capabilities may be used to produce other products as well. Capabilities vary in the utility to produce other products. The more capabilities an economy has, the more it is able to combine the individual capabilities into products. This ability becomes more important as products become more complex and the number and

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20   Hausmann & Rodrik (2003: 605, 623-626) point out that a lot of knowledge required to create or adopt technologies and products in new environments, e.g. locations or countries, is not explicit or common knowledge but rather tacit knowledge. Thus, the existing base of capabilities along with the self-discovery of cost-structures of new economic activity creates externalities that stimulate future economic activity.

degree of specialisation of necessary capabilities increases. Individuals combine their specialised capabilities in organisations as well as organisations of networks. Much the same way as a new capability can be added and combined with other capabilities to a new product, a lack of a capability leads to a gap in an output combination and prevents a product from its creation. This means that if capabilities are not available in an economy, industries cannot exist. Economies with many capabilities have many chances to combine their capabilities into new products and to turn it into economic activity and development. Economies with few capabilities have few chances to combine their capabilities into new products and therefore only few chances to turn it into economic activity and development. In addition, countries with a large variety of capabilities only need fewer capabilities than countries with a small variety of capabilities to create new products. The creation of new products is likely if the existing capabilities only need to be combined differently. The creation of new capabilities, products and industries is path-dependent (Hausmann & Hwang & Rodrik 2007: 623; Hausmann & Klinger 2006: 1-2, 5; Hidalgo et al. 2007:487; Hausmann et al. 2013: 15). [21]

This principle does not only apply to the manufacturing and export of products, but rather to the entire supply chain. The authors give the example of a country that, despite the production of fresh products, does not export fresh products. This may be due to the lack of a temperature-controlled supply chain, relying not only on cold-storage facilities but also on a green channel for fast customs processing and fresh product security certification. An investment in cold-storage facilities would be of no use, if other complementary factors were not existent. It would be difficult to put all the factors in place at one stroke. On the contrary, if necessary customs and security factors are well established, it would be much easier to add a final factor (Hausmann & Klinger 2006: 2, 5; Hidalgo et al. 2007: 484; Hausmann et al. 2013: 17, 51).

The capabilities an economy possesses are reflected in the so-called product space, as depicted in Figure 2-1 below (Hidalgo et al. 2007).

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21   The basis was developed in Hausmann & Rodrik (2003) on the self-discovery of cost-structures and externalities, in Hausmann & Hwang & Rodrik (2007) on the importance of the production and export composition, i.e. the sophistication of the export basket of a country, on economic growth of countries and in Hausmann & Klinger (2006) on the structural economic transformation of countries including their opportunities.

Figure 2-1: Product Space of The Atlas of Economic Complexity[22]
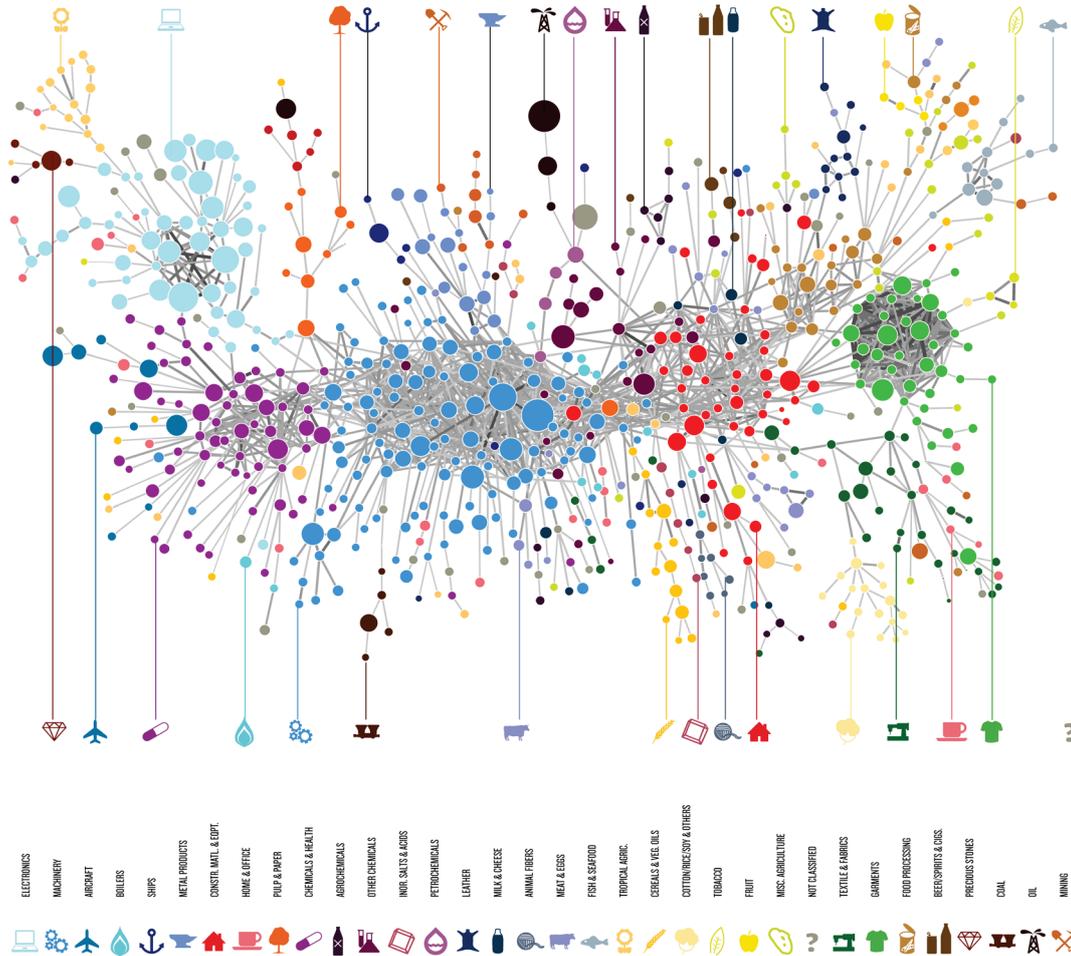
Source: Hausmann et al. 2013: 52

The product space may also shed light on unavailable factors. The product space provides the foundation for a discovery of promising path of economic intensification

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and diversification.[23] [24] Whilst, in the short-term, movements to distant areas in the product space may be difficult, in the long-term, movements to distant areas are conceivable (Hidalgo et al. 2007: 487).

The report additionally takes into account that it is not only the number of capabilities an economy has, but also whether a capability is widely available or rather rare in the world. The report regards these two aspects, the variety and the uniqueness of capabilities, as determining factors of an economy's complexity and economic potential. The report refers to it as diversity and ubiquity (Hausmann et al. 2013: 20).

Based on the previous considerations the authors established the core components of the report, the Economic Complexity Index (ECI) and the Product Complexity Index (PCI) as well as the Complexity Outlook Index (COI) (Hausmann et al. 2013: 20).

The authors acknowledge that factors such as institutions, education, competitiveness and sound finances make their contribution to economic development, albeit their calculations found that economic complexity as an indicator alone accounts for a much higher statistical explanatory power on an economy's economic development. Therefore, their report focusses on economic complexity as a means to identify paths for economic diversification and thereby a means to increase economic growth and development (Hausmann et al. 2013: 8, 35-40).

Though the authors point out, that for countries with a minor share of natural resource exports (less than 10 percent of GDP), economic complexity it a good predictor for economic development, whilst for countries with a major share of natural resources (more than 10 percent of GDP), economic complexity has a lower explanatory power for economic development. Countries with major natural resource export shares and

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23   Based on this notion, the proximity to other products, with a focus on comparative advantages Lin & Monga (2010) propose an identification and facilitation procedure for economic upgrading, diversification and, eventually, economic growth and development.

24   Interesting to note is that Hausmann & Klinger (2006: 21, 25) found that oil-exporting countries tend to be located at the periphery of the product space, implying that these countries do not have many options to move to other products. In the worst case, they are stuck in – as Hidalgo et al. (2007: 487) refer to – a "dead end". In addition, the specialisation, like in the case of oil exporting countries, ties specific assets and skills that prevent a structural movement in the product space. This characteristic applies to other raw materials and goods as well. Also interesting to note is that they found countries that performed far below the level that their position in the product space suggests.

low economic complexity can even achieve a high income per capita, since their income is related to the existence of natural resources rather than to the existence of knowledge-intensive activities (Hausmann et al. 2013: 27).[25]

Despite major strengths of this report, the authors also point at some limitations: First, export data forms the basis for the results.[26] Countries may, however, produce products which they do not export or only to a relatively small degree. Against the background of the objective of this research, the following consideration is interesting: If countries produce products that they do not export, it may indicate a lack of productivity or a lack of quality. It may just as well indicate a lack of an adequate domestic transport system or inadequate access to international transport networks. Second, the Atlas only considers exports of goods. However, exports of services may constitute a considerable share of overall exports[27]. Third, countries may export products, which they do not produce. This would distort a country's actual economic complexity. To alleviate distortions, the Atlas requires a considerable export share. Fourth, the Atlas of Economic Complexity indicates a country's location and vicinity on a map, but it does not say where to head. Countries need to decide on a strategy and decide which measures are necessary to get there. Despite the same direction, two countries may require different measures (Hausmann et al. 2013: 22, 66-67). Finally, there remains a chicken and egg problem. Coordination failures and deficient self-discovery may also prevent a movement or constrain the extension of an economy to nearby products (Hausmann et al. 2013: 29; Hausmann & Klinger & Wagner 2008: 75-76, 86).

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25   Interesting to note here is that natural resource abundance along with a low level of education may, however, limit a country's production and exports to unprocessed goods (UNDP 1996: 77, 82, 84).

26   Since capabilities are hardly measureable, the report uses information on exports, specifically products where the economy exports a higher share than the product's share in world trade, i.e. where the economy has a revealed comparative advantage (RCA) (Hausmann et al. 2013: 20, 22, 25). Their calculations and visualisations make use of the Standardized International Trade Classification (SITC 4) and the Harmonized System (HS), which is available for a wide range of countries (Hausmann et al. 2013: 6, 22).

27   Trade in commercial services, in particular trade in manufacturing services, maintenance and repair services as well as other commercial services can be used to assess trade in services (defined according to WTO 2016: 79-80) (WTO 2008: 101-102).

2.4.5 Worldwide Governance Indicators

Since 1996[28], a major source of information on the quality of governance[29] at a cross-country level are the World Bank Worldwide Governance Indicators. The project gathers and contrasts information on the quality of governance in about 200 countries. Since 2002, the Worldwide Governance Indicators are provided on an annual basis (Kaufmann & Kraay & Mastruzzi 2010: 2) and are now at the date of finalisation of this work available in the 2016 update (World Bank 2018b).

The Worldwide Governance Indicators are composed of six composite indicators, as depicted in Table 2-5 below. Each composite indicator is based on several hundred variables (Kaufmann & Kraay & Mastruzzi 2010: 2, 20). The composite indicators include Voice and Accountability, Political Stability and Absence of Violence / Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption. Although the indicators can be clearly distinguished, they are not independent of each other (Kaufmann & Kraay & Mastruzzi 2010: 4, 5).

For each composite indicator, standard normal units of the indicators and percentile rank values are provided. Standard normal units of the indicators range from +2.5 strong governance to -2.5 weak governance. Percentile rank values range from 0 lowest value to 100 highest value of all countries considered (Kaufmann & Kraay & Mastruzzi 2010: 11, 12).

The information stems from perception-based information sources, including surveys of companies and households, assessments from major multilateral development agencies, information from non-governmental organisations as well as commercial business information providers (Kaufmann & Kraay & Mastruzzi 2010: 5-7). In the course of annual changes to the sources of information, the entire indicator series is updated.

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28   The project was initiated in 1999, but provides data for the period since 1996 (World Bank 2018b).

29   The authors of the Worldwide Governance indicators define governance as the "(…) traditions and institutions by which authority in a country is exercised. This incudes (a) the process by which governments are selected, monitored and replaced; (b) the capacity of the government to effectively formulate and implement sound policies; and (c) the respect of citizens and the state for the institutions that govern economic and social interactions among them" (Kaufmann & Kraay & Mastruzzi 2010: 4).

Table 2-5: Worldwide Governance Indicators[30]

Worldwide Governance Indicators		
The process by which governments are selected, monitored, and replaced:		
Voice and Accountability	The extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	e.g. political participation, stability of democratic institutions, political and social integration (BTI); democracy index, vested interests, accountability of public officials, human rights, freedom of association (EIU); transparency of government policymaking, freedom of the press, favouritism in decisions of government officials, effectiveness in law-making body (GCS)
Political Stability and Absence of Violence / Terrorism	The likelihood that the government will be destabilised by unconstitutional or violent means, including terrorism.	e.g. orderly transfers, armed conflict, violent demonstrations, social unrest, international tensions / terrorist threat (EIU); cost of terrorism (GCS); frequency of political killings, (…) of disappearances, (…) of tortures; political terror scale (HUM)
The capacity of the government to effectively formulate and implement sound policies:		
Government Effectiveness	The quality of public services, the capacity of the civil service and its independence from political pressures; and the quality of policy formulation	e.g. quality of public administration, quality of budgetary and financial management, efficiency of revenue mobilization (ADB);quality of bureaucracy / institutional effectiveness, excessive bureaucracy / red tape (EIU); satisfaction with public transport system, (...) with roads and highways, (...) with education system (GWP)
Regulatory Quality	The ability of the government to provide sound policies and regulations that enable and promote private sector development.	e.g. regional integration, trade policy, business regulatory environment (ADB); unfair competitive practices, price controls, discriminatory tariffs, excessive protections, discriminatory taxes (EIU); burden of government regulations, extend and effect of taxation, prevalence of trade barriers, intensity of local competition, ease of starting a new business, effectiveness of antitrust policy, stringency of environmental regulations (GCS)
The respect of citizens and the state for the institutions that govern economic and social interactions		
Rule of Law	The extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	e.g. separation of powers, independent judiciary, civil rights (BTI); violent crime, organised crime, fairness of judicial process, enforceability of contracts, speediness of judicial process, confiscation / expropriation, intellectual property rights protection, private property protection (EIU); business cost of crime and violence, cost of organised crime, reliability of police services, judicial independence, efficiency of legal framework for challenging regulations, IPR protection, informal sector (GCS)
Control of Corruption	The extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	e.g. anti-corruption policy, prosecution of office abuse (BTI); corruption among public officials (EIU); public trust in politicians, diversion of public funds, irregular payments in exports and imports, (...) in public utilities, (...) in tax collection, (...) in public contracts, (...) in judicial decisions, state capture (GCS)

Source: based on Kaufmann & Kraay & Mastruzzi 2010: 4-5; World Bank 2018b

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[30] Abbrevations and Data Sources:

ADB African Development Bank Country Policy and Institutional Assessments

BTI Bertelsmann Transformation Index

EBR European Bank for Reconstruction and Development Transition Report

EIU Economist Intelligence Unit

GCS World Economic Forum Gobal Competitiveness Survey

GWP Gallup World Poll

HUM Cingranelli Richards Human Rights Database & Political Terror Scale

To make adequate use of the Worldwide Governance Indicators, it is necessary to understand its strengths, weaknesses and limitations:

First, because the true level of governance of a country cannot directly be observed, measures such as the Worldwide Governance Indicators are only an imperfect substitute. Depending on the specific purpose, other indicators than used in this indicator set may become relevant. Moreover, perception based data, like fact-based data, is only an imperfect proxy (Kaufmann & Kraay & Mastruzzi 2010: 11, 20). Second, because of margins of error in the underlying data sources and the Worldwide Governance Indicators, small changes in scores and percentiles across countries and time should not be overemphasised. This does not mean that the Worldwide Governance Indicators are not useful to make comparisons across countries and time; rather margins of error should be taken into account to check for statistical and practical significance (Kaufmann & Kraay & Mastruzzi 2010: 2, 21). Third, when comparing the composite indicator scores across countries and time, it is necessary to review the underlying source of data. The reason is that the composition of underlying indicators may have changed over time. (Kaufmann & Kraay & Mastruzzi 2010: 14). Finally, because of the high level of aggregation, the indicators are useful for cross-country comparisons, but not sufficient to derive reforms on governance. More finegrained and context as well as country-specific diagnostic data is necessary to identify constraints of governance in particular countries (Kaufmann & Kraay & Mastruzzi 2010: 21).

2.4.6 On the Value of Cross-Country Benchmarks

To begin with, in addition to these five cross-country benchmarks, a number of additional benchmarks could be drawn in; for instance, the World Bank Enterprise Survey, the Transparency International Corruption Index, the Agility Emerging Markets Logistics Index, the DHL Global Connectedness Index or the World Bank Global Investment Competitiveness Report. Because the five benchmarks presented above are expected to provide an adequate scope and sufficient entry as well as reference points, these benchmarks are put at the centre of the preceding and concomitant analysis of this work.

Despite their strengths, Hausmann & Klinger & Wagner (2008: 12-15) remark that cross-country benchmarks are, however, subject to some weaknesses.

First, a number of attributes are put together into a single indicator. Each of these attributes is itself a product of various attributes. Thus, the quality of the single indicator and attributes rests upon the mechanisms that determine their composition, i.e. the model. For instance, to create sound results, the underlying mechanisms need to adequately reflect complementary or substitution interaction. Second, benchmarks strive to identify those factors that perform poorly and could be improved in order to come closer to a target or benchmark. However, it should be taken into account that poor performance can be a situation of insufficient supply or, in contrast, a situation of insufficient demand and therefore irrelevance of that attribute. An approach that only looks at performance from the supply side ignores the demand or the context and thus the decisive factor in order to identify constraints. Third, when asking people about their opinion, the information validity depends on the quality of the statements. The sample of organisations selected for survey participation is biased, since those organisations that in the past were not able to cope with the negative effect of a constraint do not exist anymore. The opinions of these people can possibly not be included in the sample anymore. Moreover, because of a different background or context, people may interpret the same situation differently. Fourth, cross-country benchmarks place high demands on the requirements and, by doing so, limit the research with regard to the data and information that can be used. Thus, right from the start potentially relevant information may be ignored (Hausmann & Klinger & Wagner 2008: 25, 32). Despite these weaknesses, international benchmarks may provide a valuable source of information and may complement other approaches and sources of information (Hausmann & Klinger & Wagner 2008: 15-16, 38, 59).

The above presented cross-country benchmarks are valuable to this research in two ways. First, these five benchmarks provide information on the state of supply chain performance in various countries and, thereby, provide the basis for the case selection process in chapter four. Second, these benchmarks provide entry and reference points for identifying binding constraints of supply chain performance in selected countries. Albeit valuable, they do not allow answering the central question of this research on constraints of supply chain performance adequately. For this reason, the next chapter will develop an appropriate research approach, design and methodology.

3 Research Approach

A preliminary analysis on the state of supply chain performance in southern African countries was conducted and will be presented later on in chapter four and five. The preliminary analysis has shown that there is already a lot of information available on supply chain performance in southern Africa. The existing information is, however, not able to help answering the research questions. The information either has a lack of specification regarding the research questions, raises questions about the data validity or exhibits gaps in the data. For these reasons, chapter three, develops a research approach, design and methods that allow the providing of answers to the research question on how constraints of supply chain performance can be identified.

3.1 Research Design

Logistics and manufacturing performance of countries is determined by a variety of factors. Whilst some factors may have a level that is conducive to supply chain performance, others may have a level that is detrimental. Despite the positive contributions of conducive factor levels, negative contributions of any factor levels may constrain the supply chain performance of a country. The knowledge about these factors is expected to help to explain why countries remain at a certain level of supply chain performance and why countries do not get on to a higher level of supply chain performance. Often, these factors are, however, unknown or not well identified. For this reason, at its core this work intends to generate ideas on the factors that constrain further improvements of supply chain performance in southern African countries. Based thereon, this work aims at identifying the factors that constrain improvements of supply chain performance in southern African countries.

This research focuses on causal analysis and a selection of corresponding research methods to identify those constraints. Causal analysis comprises methods that make causes, causal mechanisms and causal effects visible (Gerring 2007: 43-44). Causal mechanisms are typically expressed by the relation of independent and dependent variables. The independent variables constitute the explanatory (causal) factors that determine the explained variable or outcome (Gerring 2007: 21). This research aims to explain the factors that constrain further improvements of supply chain performance of selected countries. It is therefore a hypothesis-generating causal analysis. Information on measures that allowed other countries or countries on average to improve supply chain performance exists. It is, however, unknown whether the countries under

analysis are subject to the same relevant context or conform to the average country. It may just as well be that the countries under analysis differ therefrom. Thus, by default, it should not be assumed that the countries conform to the average country (cf. Hausmann & Klinger & Wagner 2008: 4-6, 85; UNIDO & UNCTAD 2011: 34). This research acts on the assumption that the countries under analysis are subject to a specific context. Their individual context has an influence on their constraints and measures for improvement. A research method that is particularly well suited to such a hypothesis-generating, context-specific causal analysis is case study research. Its explorative character can help to give holistic insight into dense empirical information and, equally important, in due consideration of the local, specific context (Gerring 2007: 41, 48).

Case study research can be defined as the investigation of a single case or multiple cases that aim at illuminating a larger number of cases or so-called population (Gerring 2007: 86). The case of a study refers to a spatially limited unit that exhibits specific characteristics, which can be observed at a certain time or in a certain period. A case is often represented by a program, event, activity, process or one of more individuals (Creswell 2014: 14; Yin 2009: 29). An argument that speaks in favour of the selection of a country as a case is the fact that national states come with a set of specific attributes and attribute levels. Attributes and attribute levels characterise a country with regard to its political, economic, geographic and social structure and processes. Both the economic and political settings as well as geographic settings have an influence on the economic performance of a country. Even in geographic areas that are close by, economic and political settings may dominate geographical settings. That means national states entail a powerful set of attributes that significantly influence economic performance. Their effects may stop at the border, irrespective of any geographical attributes (c.f. Acemoglu & Robinson 2012: 42, 63). A country or nation state promises a high explanatory power for its level of supply chain performance. For this reason, a country represents the central unit of analysis, a case, in this research.

In case study research, the number of cases under investigation is relatively small, as opposed to cross-case study (Gerring 2007: 87). A case study can be limited to less than or equal to 12 cases, whereas cross-case study deals with a larger number of cases and increasingly shifts to non-case study or quantitative work. However, the distinction between case and cross-case study is vague. Even a case study may comprise some cross-case elements, such as the aggregated analysis of many peripheral cases as part of the introduction and conclusion of a case study. Thus, case study

and cross-case study can complement one another very well. Whilst on the one hand, the small sample of a case study allows for in-depth investigation, on the other hand it leads to a lower homogeneity between the sample and population (Gerring 2007: 20-22). That is the typical trade-off between case study and cross-case study research (Gerring 2007: 33, 37). In this research, the quest for comprehensive insight outweighs the desire for a high homogeneity between the sample and population.

Case study research is open for both qualitative as well as quantitative research methods, as Gerring (2007: 33) points out. Similarly, Creswell (2014: 14) states that case study research makes use of a variety of information collection procedures.

As indicated, this research makes use of the differences in supply chain performance among countries. It is expected that countries face different constraints, depending on their stage of supply chain performance. Countries at a lower stage of supply chain performance may be faced with constraints that countries at a higher stage have already overcome (cf. Arvis et al. 2016: 4). The underlying idea is that differences in supply chain performance may point to differences in constraints. Because of the small sample size, high depth of analysis and specific research approach, a random selection of cases would not provide the envisioned information. A non-random case selection procedure is necessary (cf. Gerring 2007: 87). In order to direct the focus to those factors that can account for the differences and to exclude factors that cannot account for differences, but rather similarities, the case selection process searches for cases that are similar on many independent variables but differ on the dependent variable (Gerring 2007: 131). It follows a most-similar case approach. A most-similar case study approach requires at least two cases (Gerring 2007: 90).

A promising approach to identify the factors that constrain further improvements of supply chain performance of countries is a technique, introduced by Ricardo Hausmann, Dani Rodrik and Andrés Velasco (2008), called "Growth Diagnostics". Their approach is based on the idea that an economy can have many factors that constrain economic activity, but only few of those factors are actually binding, that is keeping an economy below its achievable productivity frontier and constraining its economic growth (Hausmann & Rodrik & Velasco 2005: 327). A removal or alleviation of a non-binding constraint would not provide further economic growth since it is the binding constraint that first needs to be removed or alleviated. A constraint is binding when a removal or alleviation of that constraint allows further economic growth. In case of many binding constraints, it is the most binding constraint that should be removed or

alleviated. It can be that a constraint is caused by another constraint, so that the diagnosed constraint is rather a consequence than the root cause (Hausmann & Klinger & Wagner 2008: 18, 40). The growth diagnostics approach aims at eliminating binding constraints that have the largest direct positive effects for economic growth (Hausmann & Rodrik & Velasco 2008: 331). Since measures to eliminate binding constraints of supply chain performance can nevertheless entail negative effects to other factors or processes, the direct effects of those measures for bottleneck elimination should be highly positive (Hausmann & Klinger & Wagner 2008: 19).

There are a number of alternative approaches to the growth diagnostics approach: First, the identification and attempt to eliminate all constraints, second, the identification and attempt to eliminate all practically removable constraints, third, constraints that entail positive effects and at the same time the least negative effects for other factors, or to eliminate the largest distortions represent major alternative approaches. Their large scope, their inability to correctly assess the interactions among the various factors and measures or the lack of sufficient information concerning interactions and actual effects, respectively, may however cause problems of implementation (Hausmann & Rodrik & Velasco 2008: 329-331; cf. UNIDO & UNCTAD 2011: 34, 36, 58). Due to limited financial resources, the attempt of tackling too many constraints at once is often not feasible. Investing in other than the most promising improvement measure will lead to opportunity costs. It is therefore productive to focus on the most promising constraints. This consideration is no less true for improvements of supply chain performance (Hall & McCalla & Comtois 2011: 1; Feige 2007: 25). In contrast to a top-down approach, as pursued by growth diagnostics, a bottom up approach is pursued by a cost-benefit analysis of all perceivable measures. This, however, requires that all possible measures are known as well as taken into account. Since this cannot be expected, a cost-benefit analysis should not substitute but rather complement a growth diagnostics approach (cf. Hausmann & Klinger & Wagner 2008: 20).

The growth diagnostics approach is not limited to the subject of economic growth. Rather, it can be applied to other economic subjects as well (Hausmann & Klinger & Wagner 2008: 20). Against the background of this research, this procedure could be applied to identify binding constraints of improvements of supply chain performance.

Like in growth diagnostics on economic growth (Hausmann & Klinger & Wagner 2008: 17), in growth diagnostics applied to supply chain performance, it may be tempting to expect that in the case of low level supply chain performance of a country, all factors

of supply chain performance are performing poorly and, thus, all factors are binding. However, because factors exert different effects on the level of supply chain performance, this notion is unlikely to be the case.[31] Moreover, on the one hand, it is perceivable that constraining factors on supply chain performance interact through compensating or substituting mechanisms. Measures that allow improvements in one factor compensate or substitute a shortfall in performance of other factors. On the other hand, it is perceivable that constraining factors interact through non-compensating or complementing mechanisms. Measures that allow improvements in one factor do not compensate or substitute a shortfall in performance of other factors. Although the growth diagnostics approach tends to side with non-compensating or complementary mechanisms, the approach takes into account that in practice both mechanisms can be found (Hausmann & Klinger & Wagner 2008: 16-18). Factor or, in other words, attribute interaction effects are presented and discussed at length in section 3.2.1.1.3.

Against the background of the comparative country approach of this work, it is interesting to note that Hausmann & Klinger & Wagner (2008: 46, 51) state that heterogeneous performance across geographic areas may point to constraints that exist in one area, while other constraints exist in another area. If a constraint is expected to be more distinct in one geographic area than in the other, the question is whether this is reflected in the level of a country's performance. To put it differently, factor levels that are identical across geographic areas should lead to the same effects on supply chain performance. Moreover, it could be useful to know which factors of influence stem from the broader geographic area and which stem from the country itself (Hausmann & Klinger & Wagner 2008: 46, 51). Finally, it should be noted that even if the same factors constrain supply chain performance of different countries, because of the different background, the actions to tackle these binding constraints may differ from country to country (Hausmann & Klinger & Wagner 2008: 19). Thus, despite the pursuit of a most-similar approach and pursued similarity among countries, differences are expected.

The growth diagnostics approach takes advantage of the following four symptoms: If (a) the price or shadow price of the constraining factor is high, if (b) changes in the

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31   For instance, from the fact that the Doing Business ranks and scores of a country vary
      considerably across components, the authors of Doing Business 2018 conclude that
      an economy may provide a good regulatory performance in one area, whilst providing
      a poor regulatory performance in another area (World Bank 2018a: 12, 124).

constraining factor lead to considerable changes in the resulting product, if (c) stake-holders try to bypass a constraining factor or if (d) stakeholders that are less affected by that constraint tend to be more successful, a constraint is likely to represent a binding constraint (cf. Hausmann & Klinger & Wagner 2008: 31-47). Hausmann & Rodrik & Velasco (2008: 355) refer to these effects as diagnostic signals.

The information of binding constraints may be of many different types of information and stem from many different sources. The information may include quantitative and qualitative information as well as information from surveys, reports or press releases. Many pieces of evidence are gathered and fitted together by economic reasoning to form the essential information (Hausmann & Klinger & Wagner 2008: 25, 26, 38-39, 42, 48). This aspect is picked up again during the selection of research methods.

Finally, what this research approach should yield is a clear prioritisation of actions for improvement or intervention (cf. Hausmann & Klinger & Wagner 2008: 19-20, 91).

3.2 Research Method

The preceding chapters and sections have set the direction for what is to come in this section, the selection of corresponding research methods. Three considerations need to be taken into account before a decision on the research method can be made.

First, the selection of methods should be made based on methodological principles in order to ensure that the methods are suited to provide an answer to the research questions and to meet the research objectives. Four fundamental principles lend themselves to social science research:

1. Principle of openness: The research should be open for unexpected information, in particular open for previously unconsidered and even contradictory information.

2. Principle of a theory-guided procedure: The research should come from the exist-ing body of knowledge in order to make a contribution to it. It should only be men-tioned in passing that this principle partly stands in contrast to the principle of openness.

3. Principle of a rule-guided procedure: The research should follow a clearly defined set of rules that allows other researchers to understand the research procedure.

4. Principle of understanding: The research should make the quest for understand-ing a fundamental and inevitable task on the way to deduce a theory. An essential

thing to note here is that understanding is, however, an interpretation by itself. Understanding is a constitutive result of research in social science.

These four principles, irrespective of the insight of causation that is aimed at (e.g. causal mechanisms or causal effects) and the nature of the research approach (e.g. quantitative or qualitative approach), apply to research in social sciences (Gläser & Laudel 2010: 29-33).

Second, a decision needs to be made on the central source of information. A potential source of information are knowledgable people in the domains of supply chains. Such knowledgeable people are often referred to as experts or, even more distinguished, domain, special or subject matter experts. The characteristics of an expert role go far beyond the possession of knowledge in a field. First, this is because that expert knowledge is supposed to be well-thoughtout and coherent and is considered to result in actions that shape real-world structures. Second, expert knowledge and actions are considered as having an impact not only on their own but on the information, mind-set and actions of other people as well. Their position in organisations and in society allows experts to play a significant part in the process that decides on the perspective from which the society looks at and adresses certain issues. Consequently, experts and their knowledge are determinants in the arrangement and functioning of societies (Bogner & Littig & Menz 2014: 10-15). A further distinction can be made between an expert and a specialist. Whilst an expert possesses in-depth knowledge in a certain field and is, at the same time, able to bridge the gap to other related areas of knowledge as well as to put it into the larger context, specialists possess in-depth knowledge only in a certain field (Hitzler 1994: 25; Bogner & Littig & Menz 2014: 14). Being an expert is, however, not a personal characteristic or ability. Being referred to as an expert results from specific attributes of an individual with regard to a research problem. Based on this specific expertise, society, people, and researchers assign or ascribe an expert role in a specific field to an individual. Therefore, the expert role is a methodological construct to approach and solve a research problem (Bogner & Littig & Menz 2014: 11; Kaiser 2014: 39). Experts and expert knowledge are expected to shape the arrangement and functioning of supply chains as well. In order to make operational, tactical or stragegical decisions on routes and locations and their inter-play,experts in the private and public sector need to know about the past and present performance as well as being aware of the performance of future scenarios. Often, their overall aim is to bypass or eliminate constraints in order to allow for smooth operations. For this reason, knowledgable people or experts, at the managerial level

of private and public as well as public-private organisations represent the central source of information of this research. Despite the determinant role of experts and expert knowledge in the arrangement and functioning of societies, expert knowledge is often neither as unambiguous, unanimous nor systematic as it might be expected to be. The lack or limitation of possibilities to verify the information makes the use of expert knowledge even more problematic. The importance of expert knowledge on the one hand and the characteristics of expert information on the other hand make the use of expert knowledge a balancing act. Thus, the use of expert knowledge requires the use of an in-depth and differentiated analysis (Bogner & Littig & Menz 2014: 4).

Third, the choice of a research method is affected by the view that the researcher holds on the relation between social reality and knowledge (Creswell 2014: 5-6; Bogner & Littig & Menz 2014: 6):

In research that leans towards a view where a set of discrete causes determine an outcome or result into an effect, as represented by a postpositivist view, a quantitative method is most suitable. This approach starts with a theory and then tries to reject or support a hypothesis (Creswell 2014: 7-8). A quantitative method, more precisely, a self-administered, closed-response survey approach with its defined structure of factors and resulting advantages for the statistical aggregation and comparability seems appealing in order to generate ideas on and identify constraints. Such a survey would allow the collecting of standardised information on constraints of supply chain performance from a larger number of respondents. However, the clear structure and limitation of questions and answers as well as static behaviour of a survey do not allow leaving the prescribed paths of questions and answers (cf. Johnson & Morgan 2016: 2, 12). Yet, information that differs from or goes beyond the questionnaire may be relevant. This may include information on aspects which have not been considered in the design of the questionnaire or information on the context which helps to understand the functioning of overall supply chain systems. In addition, quantitative methods may only be able to measure factors, which are known or can be assumed to exist in all cases of analysis (Gläser & Laudel 2010: 37). Thus, a quantitative method alone may not sufficiently account for the principle of openness. Once there is a shift from a postpositivist view towards as view, where based on experiences, interactions with others and historical and cultural norms, individuals develop subjective meanings towards certain objects, a stronger reliance on the decision maker's view may be advisable.

In research that leans towards a view where individuals construct their meanings, as represented by a constructivist view, a qualitative method is most suitable. Instead of beginning the research with a theory, the constructivist view and qualitative methods alike tend to develop a theory or pattern based on the collected information (Creswell 2014: 8-9). The constructivist view and qualitative methods are better able to account for the principle of openness. Largely independent from a prescribed structure of questions and answers an open-response face-to-face survey, or more precisely qualitative interview, would allow experts to explain their opinion on constraints of supply chain performance of a country. This could reveal different as well as additional information (cf. Johnson & Morgan 2016: 2, 12). In contrast to quantitative methods, qualitative methods do not so much reduce the complexity of issues during data collection but rather successively during the data analysis (Gläser & Laudel 2010: 27).

In research that sides with both a postpositivist and a constructivist view, a combination of both views with a high emphasis on situations, actions and their consequences and the central research problem in a so-called pragmatic view seems reasonable (Creswell 2014: 10-11). The underlying notion is that "(…) the combination of qualitative and quantitative approaches provides a more complete understanding of the research problem than either approach alone (…)" (Creswell 2014: 4). If, both quantitative and qualitative methods are able to play to their strengths to shed light on a research problem, a multiple or mixed methods approach represents an option (Creswell 2014: 14-15, 215). Because the case study and growth diagnostics approach militate in favour of a pragmatic view[32], the case study and growth diagnostics approach speak in favour of an application of both quantitative and qualitative methods, and the combination of both methods in this reaseach is expected to help to illuminate the research problem better, a mixed methods approach is pursued.

Equal emphasis is given to the quantitative and qualitative method. The quantitative and qualitative data is collected as well as analysed separately and, eventually, the two types of information are merged in order to compare their results. The idea of this approach is that each type of data brings different types of information. Thereby one database helps to explain the other database. Moreover, the information is used to check for the accuracy of each respective database. Thus, a convergent parallel mixed methods design is applied. Other mixed method designs, such as any of the

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32   In addition to the preceding remarks, cf. Hausmann & Klinger & Wagner (2008: 48).

sequential designs, would be an option, provided that the organisational frame of the project allowed for such a procedure (cf. Creswell 2014: 15-16, 219, 232).

Nonetheless, despite a number of advantages of a mixed methods approach – compared to sole reliance on either quantitative or qualitative methods – a mixed methods approach poses some challenges. First, to prepare two types of methods as well as to collect and analyse two types of data is more time-intensive. Second, the two major sources of data bring more complexity to the analysis (Creswell 2014: 218-19).

3.2.1   The Quantitative Method

The research method has already pointed to a closed-response survey as a first major method to obtain the necessary information on potential constraints of supply chain performance. Information on factors that do not perform according to the expectations would provide a starting point. This may, however, yield a high number of unprioritised underperforming factors. Therefore, there is a need for a prioritisation of underperforming factors. Information on the importance of these factors to the functioning of supply chains could provide the necessary prioritisation of potential constraints. Factors, which do not meet the expectations and which are important to the functioning of supply chains are likely to represent constraints of supply chain performance. However, neither importance nor performance of supply chain performance can directly be observed as a real world phenomenon. For this reason, constructs and domains to capture information on importance and performance need to be developed (Johnson & Morgan 2016: 6, 35, 40). This section designs the instrument to capture respondent's attitudes to constructs of importance and performance of supply chain domains. Important to note here, is that the survey should approach as many potential respondents as possible, irrespective of the geographical location of the respondents and researcher. To make this possible, an online questionnaire is intended to be developed.

This section starts by designing an instrument for measuring the importance of attributes and then, in the second step, moves on to design an instrument for measuring the performance of attributes. This is because the measuring of importance places high requirements on the instrument design. It is expected that the design of the importance-measuring instrument will set the direction and provide a well-thoughtout foundation for the performance-measuring instrument.

3.2.1.1 Importance Measuring

To obtain information on the importance of factors of supply chain performance, the perceived importance of factors by respondents could be measured. To get there, multiattribute or multidimensional preferences measuring may provide a solution.

3.2.1.1.1 Multiattribute Preference Measuring

There is a variety of methods for measuring preference values, or in other words, importance values of respondents regarding specific attributes (Sattler 2006: 156).

First, there are methods where respondents directly state their preference for individual attribute levels and attributes, which are then composed to multi-attribute utility values. Because these methods compose individual attribute utility values to mulit-attribute utility values, these methods are classified as compositional approaches. One of the major compositional methods is the self-explicated method (Sattler 2006: 156, 157). Their isolated attribute structure reduces the amount of information to be memorised and processed by respondents simultaneously. Therefore, self-explicated approaches can be of an advantage, both in the case of a single attribute or multiple attributes (Srinivasan 1988: 295; Green & Srinivasan 1990: 9). Since in real decision situations decision makers usually evaluate multiple attributes at a stroke, their isolated attribute structure is at the same time their disadvantage. Respondents may find it difficult to isolate coherent attributes and may rather be tempted to evaluate multiple attributes in combination (Hainmueller & Hopkins & Yamamoto 2013: 3). In addition, although respondents usually have preferences, they may be unable to articulate their true preference score (Johnson 1974: 121). Because it is not clear how respondents arrive at their stated preference, the meaning of compositional approaches is questionable. Importance values should rather be derived from the value of shifting from the least preferred to the most preferred attribute level (Srinivasan 1988: 296).

Second, there are methods where respondents reveal or state their preferences for multi-attribute objects, which are then decomposed into utility values for individual attribute levels and attributes. Because these methods decompose multi-attribute values into individual attribute values, these methods are classified as decompositional approaches. Revealed preference approaches use observed actions to calculate attribute preferences; stated preference approaches use experimental data to calculate attribute preferences (Sattler 2006: 156). Hainmueller & Hopkins & Yamamoto (2014: 27) state that stated preference approaches should be treated with caution, since

there remain concerns about the validity of the stated preference. What respondents state in a survey or an experiment may differ from what they actually do in real world situations. If there are qualitatively and quantitatively sufficient observable actions available, revealed preference approaches may be of an advantage as they directly reflect real world decisions. If this is not the case, stated preference methods can represent the second best approach. Diamond & Hausman (1994) suggest that researchers should restrict their investigation to the observation of taken actions. The characteristic of a simulated decision situation may, at the same time, turn out to be of advantage if specific attributes and levels do not (yet) exist in the market (Danielis & Rotaris 1999: 31). From the high number of applied stated preference approaches in the last decade, Hainmueller & Hopkins & Yamamoto (2014: 27) conclude that there is a widely held belief among researchers that stated preference approaches can help to explain real decision situations. One of the major compositional methods are variants of conjoint analysis (Sattler 2006: 158). Against this background, the question is not whether stated preference or revealed preference approaches are preferred, but rather, whether compositional or decompositional methods are more appropriate for explaining real world decisions. Both compositional and decompositional approaches suppose that the relevant attributes are known prior to the analysis (Sattler 2006: 159). In general, decompositional approaches have an edge over compositional approaches because their multi-attribute design may come closer to real decision situations and are thus easier to evaluate (Hainmueller & Hopkins & Yamamoto 2014: 3).

Third, there are combined approaches. Because these methods combine compositional and decompositional approaches, these methods are classified as hybrid approaches. The idea is to counterbalance the weaknesses of each individual's approach in a combined approach. Nevertheless, the use of hybrid approaches brings both advantages as well as disadvantages. In designs with a small number of attributes and attribute levels, it is questionable whether hybrids outmatch their components in their original form (Green & Goldberg & Montemayor 1981: 39; Green 1984: 156, 167). The more the attribute and attribute level number increases, the more hybrid approaches are likely to gain an edge (Cattin & Hermet & Pioche 1982: 143).

Because decompositonal methods require trade-offs between attributes and are closer to real world decision situations than compositional approaches, a decompositional stated preference method is expected to yield more reliable importance values. The next section moves on to look in more detail at decompositional approaches as well as – because of their integral compositional component – hybrid approaches.

3.2.1.1.2 Decompositional Preference Measuring

During the 1960s, the conjoint analysis or conjoint measurement evolved from the area of mathematical psychology (Luce & Tukey 1964; Krantz 1964; Kruskal 1965). During the 1970s conjoint analysis was first applied to marketing research (Green & Rao 1971; Green & Wind 1975: 108). The aim is so simultaneously measure the effects of multiple independent variables on a single dependent variable. Since then, the conjoint analysis has expanded to other areas of application. A number of analyses have been applied to the field of supply chains.[33] An overview of contemporary applications of conjoint analysis can be found in Green & Srinivasan (1978: 116), Danielis & Rotaris (1999), Teichert (2001: 10) as well as Backhaus et al. (2011: 461). Hainmueller & Hopkins & Yamamoto (2014: 28) state that conjoint analysis is also a promising method for political science, where researchers and policy makers aim to design public policies. Consequently, the application and value of conjoint analysis goes well beyond the field of marketing and may also be of value in the field of supply chain management.

The conjoint analysis does not refer to a single approch but rather to a group of approaches. Despite a lack of a common definition, a number of constituting characteristics of conjoint analysis approaches exist (Teichert & Sattler & Völckner 2008: 657).

First, as indicated earlier, conjoint analysis refers to a group of de-compositional approaches that transform subjective responses into estimated parameters (Green & Srinivasan 1978: 103). Each approach has individual strengths and weaknesses (Teichert & Sattler & Völckner 2008: 653). The fact that attribute combinations are considered jointly explains the name conjoint analysis (Green & Rao 1971: 355). Second, since multiple attribute levels or, in other words, factor levels are varied simultaneously, the conjoint analysis applies a factorial design. Third, since attribute levels

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33   The following studies have been applied to the field of supply chain: Backhaus & Ewers & Büschken (1992) applied a conjoint analysis to freight transport services to measure the importance of attributes of road and rail transport. Danielis & Rotaris (2002) and Danielis & Marcucci & Rotaris (2005) applied a conjoint analysis to freight transport demand preferences of manufacturing companies. Ninnemann (2006) applied a conjoint analysis to measure customer requirements in seaport competition. Feige (2007) used a conjoint analysis to measure the importance of freight transport performance attributes of manufacturing and distribution companies. Cf. also Fowkes & Shinghal (2002), Bolis & Maggi (2002), Fridstrøm & Madslien (2002), Maier & Bergman (2002) with regard to attribute preferences of road, rail and intermodal transport. These studies aimed to provide information to guide public and private interventions.

are varied systematically, the conjoint analysis applies an experimental design (Backhaus & Erichson & Weiber 2013: 262). Fourth and finally, the conjoint analysis applies simulated decision situations where, instead of empirical preferences and decisions, hypothetical preferences and decisions are elicited (Teichert & Sattler & Völckner 2008: 657). Multi-attribute object models, so-called stimuli, represent potential or existing objects (MacLachlan & Mulhern & Shocker 1988: 42).

Conjoint designs vary in their stimulus construction, in their procedure of data collection and in their preference calculation. The conjoint analysis has different construction types; the major types are presented briefly:

- Preference based conjoint analysis:

  In preference-based conjoint analysis, a complete or reduced set of multi-attribute objects is presented to respondents and respondents evaluate these objects using rankings or ratings. This ordinal or metric data is used to calculate metric attribute values. The preference-based conjoint analysis is often referred to as the traditional conjoint analysis (TCA) (Backhaus et al. 2011: 457-479).

- Pairwise Trade-Off Conjoint Analysis:

  In a pairwise trade-off conjoint analysis, two attributes with all attribute levels are combined in a table and respondents state their preference for each cell combination by assigning a rank. The ordinal data is used to calculate metric attribute values (Johnson 1974).

- Choice-based conjoint analysis:

  In a choice-based conjoint analysis (CBCA), a subset of multi-attribute objects is presented to respondents, each in a single step. In each step, respondents choose their most preferred multi-attribute object. The relative importance is calculated based on the strength of choice of attributes and superior attributes. (Backhaus & Erichson & Weiber 2013: 173-217).

- Adaptive Conjoint Analysis:

  In an adaptive conjoint analysis (ACA), first respondents evaluate the relative preference of attribute levels for each attribute. Based on this data, the importance of each attribute level is calculated, which in turn helps to eliminate irrelevant attribute levels. Second, respondents are shown a pair of fractions of stimuli, consisting of only some attributes, and state their strength of preference for one fractional stimulus. This task is repeated in several steps with varying attributes and attribute

levels. The more this pairwise evaluation proceeds, the more precise the estimated utility values become. The relative importance of attributes is based on the strength of attributes and superior attributes (Sawtooth 2007).

Whilst the TCA asks for preferences either by rankings or ratings and provides ordinal or metric data, the CBCA and the ACA ask for choices between a subset of stimuli and create nominal data. Therefore, the information obtained by means of a TCA is larger than in a CBCA or ACA and there is no stringent necessity for data aggregation in order to obtain sound results (Backhaus & Erichson & Weiber 2013: 175-176).

Whilst in a CBCA and ACA stimuli are presented in smaller sets of stimuli and in several steps, the TCA presents its stimuli at once to the survey participant. On the one hand, presenting all stimuli at once could result in information overload for the participant. On the other hand, requiring the respondent to make several decisions, each in a new step, could result in signs of fatigue and decrease the information quality as well (Backhaus, Erichson and Weiber 2013: 183).

Similar to the other conjoint approaches, the pairwise trade-off conjoint analysis has the strength of generating data of a high measuring level based on rather simple input data. The weakness of the pairwise trade-off conjoint analysis is, unless not split up into subset trade-off tasks, the fact that respondents need to trade off each possible attribute combination in a trade-off table, which would very quickly – depending on the number of attributes and levels – overwhelm the respondent (Johnson 1974: 125).

Because of the low number of steps that respondents need to proceed and the relatively low requirements (at least compared to adaptive and choice-based conjoint analysis) to the survey tool, it is expected that a decompositional, more specifically, a traditional conjoint analysis can be implemented by means of a standard survey tool. The use of a standard survey tool would allow combining a conjoint analysis for importance measuring with an instrument for performance measuring in a single survey. In addition, the data could be processed with standard statistical software. Nonetheless, the risk of a high information load on respondents still needs to be overcome.

3.2.1.1.3 Design of a Conjoint Analysis

The conjoint analysis is designed as follows: First, since the conjoint analysis assumes that there is an objective selection of attributes that determine subjective preference decisions (Teichert & Sattler & Völckner 2008: 658), the attribute and attribute

levels to be taken into account need to be identified and selected. Second, the evaluation design needs to be created. After creating the design, respondents evaluate the multi-attribute objects. Finally, the attribute preference and importance values are calculated.

Identification of Attributes

The identification and selection of attributes and attribute levels is of particular importance since the attributes and attribute levels, which are presented to the respondent, set limits to the respondent's evaluation and thereby have a stake in the validity of the respondent's stated preference (MacLachlan & Mulhern & Shocker 1988: 41).

Procedures for identification of potentially relevant attributes can be classified into direct, projective and comparative procedures. Direct procedures directly identify potentially relevant attributes by using document analysis, interviews and elicitation techniques. For instance, as Creswell (2014: 20) points out, at a stage where the relevant variables of an instrument are not known, qualitative methods could help to identify relevant variables; or alternatively, qualitative methods could help to improve a quantitative instrument. Such a procedure would conform to an exploratory or explanatory sequential mixed methods approach (Creswell 2014: 16, 224-227). Likewise, Bogner & Littig & Menz (2014: 22) state that qualitative interviews can be used to explore a field. Projective procedures indirectly identify potentially relevant attributes by using the information interviewees provide based on what they associate with ambiguous stimuli such as pictures, products or questions. Comparative procedures use the interviewee's perceived similarity or dissimilarity of attributes and their differentiator to identify potentially relevant attributes (Weiber & Rosendahl 1996: 561-565).

Because of a plethora of information on determinants of seaport, road transport, rail transport as well as manufacturing location performance, it is expected that the direct procedure of a document analysis is well suited to identify and select the relevant attributes. The document analysis started with a search for attributes that may have an influence on the performance of seaports, road transport networks, rail transport networks and manufacturing locations. A selection of literature and pertaining sources of information[34], consulted to select the attricutes, is provided in Table 3-1 below.

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34   Note that this list of literature and pertaining source of information is not exhaustive. A wealth of sources was consulted to compile the attribute structure. These sources are the most formative and extensive sources of information to the attribute structure.

Table 3-1: Document Analysis

Source and Title		Seaports	Road Transport Networks	Rail Transport Networks	Manufacturing Location
	Supply Chain Area				
AfDB & World Bank & ICA 2011	Handbook on Infrastructure Statistics	X	X	X	X
AfDB 2010	African Development Report 2010	X	X	X	X
Arvis et al. 2007, 2010, 2012, 2014	Connecting to Compete 2007, 2010, 2012, 2014, 2016	X	X	X	X
Arvis et al. 2011	Connecting Landlocked Developing Countries to Markets	X	X	X	X
Becker 2014	Handbuch Schienengüterverkehr			X	
Blanke et al. 2013	The Africa Competitiveness Report 2013	X	X	X	X
Foster & Briceño-Garmendia 2010	Africa's Infrastructure	X	X	X	X
Gwilliam 2011	Africa's Transport Infrastructure	X	X	X	
Hausmann et al. 2013	The Atlas of Economic Complexity				X
Ninnemann 2006	Seehafenwettbewerb in Europa	X			
Ranganathan & Foster 2011:	The SADC's Infrastructure	X	X	X	X
Teravaninthorn & Raballand 2009	Transport Prices and Costs in Africa		X	X	
Tongzon 2009	Port choice and freight forwarders	X			
World Bank 2009b	Beyond the Bottlenecks	X			
World Bank 2014	Doing Business 2015	X	X	X	X
World Economic Forum 2014	Global Competitiveness Report 2014-2015	X	X	X	X

Selection of Attributes

In order to provide an adequate response format for measuring preferences, the attributes, the attribute levels as well as the attribute structure need to comply with a number of requirements from different perspectives (Weiber & Mühlhaus 2009: 45).

First, the attributes, the attribute levels as well as the attribute structure need to fulfil interviewer, decision maker or user requirements.

- Independence of attributes:

  The attributes need to be empirically independent, which means that the attribute level of one attribute cannot be inferred from the attribute level of another attribute. Otherwise, different attribute levels are independently assigned to dependent attributes. This would lead to unrealistic attribute level combinations (MacLachlan & Mulhern & Shocker 1988: 42).

- Completeness of attributes:

  The attributes need to be complete, which means that all attributes that have an influence on the decision need to be available and selectable. Omitting relevant attributes will lead to unrealistic decision-making situations and, thereby, result in distorted decisions. Interviewees may incorrectly assign more information to the existing attributes than they are actually supposed to carry. The result is a loss of control over the existing attributes. Below the line, it remains a trade-off between the most realistic and the most feasible decision situation from the respondents' point of view (Johnson & Levin 1985: 170; MacLachlan & Mulhern & Shocker 1988: 41-42).

- Influenceability of attribute levels:

  The attributes need to be influenceable, which means that the decision maker should be able to amend the attribute level (Shocker & Srinivasan 1974: 922). However, if there are attributes, which are important for the decision but cannot directly be amended, it may be reasonable to consider non-influenceable attributes too, since they provide information that could be considered as relevant for the overall decision (Weiber & Rosendahl 1996: 566; Weiber & Mühlhaus 2009: 46).

- Feasibility of attributes:

  The attribute levels need to be possible to realise. Unfeasible attribute levels only provide a very limited informational benefit and may provoke scepticism by interviewees (Weiber & Mühlhaus 2009: 47). The same applies to the attribute combinations (Hainmueller & Hopkins & Yamamoto 2014: 26).

Second, the attributes, the attribute levels as well as the attribute structure need to fulfil interviewee requirements. These requirements concern the perception and ability to respond of the interviewee:

- Relevance of attributes:

  First, the attributes need to be important, which means that a change in an attribute level should result in a change of preference of the respondent (Weiber & Mühlhaus 2009: 47). It could be distinguished between attribute importance and attribute determinance. Although decision makers may regard an attribute as important for a decision, at the same they take a specific attribute level for granted. Thereby respondents create a level playing field where all attribute combinations are expected to be equipped with a specific attribute level and based thereon they only choose their determinant attributes. Important but non-determinant attributes may turn into determinant attributes once the availability of specific attribute levels cannot be taken for granted anymore (Myers & Alpert 1968: 13-14). Second, the attribute levels should, at the same time, be able to unfold their effect and, despite feasibility, not be disabled by other factors (Weiber & Mühlhaus 2009: 47).

- Limitation of attributes and attribute levels:

  Humans are subject to bounded rationality (Simon 1955) that is, their information memory and processing capacity is limited. At the same time, the demand on humans' information memory and processing capacity increases, amongst other factors, with more attributes and attribute levels (Bettman & Luce & Payne 1998: 189). Therefore, the number of attributes and their levels should be adapted to the memory and processing capacity of the respondents. There is, however, no general recommendation concerning the number of attributes and attribute levels. Green and Srinivasan (1978: 108) recommend limiting the number of attributes to five or six. Green & Srinivasan (1990: 11) state that six or fewer attributes work best in a full-profile method. In full-profile methods with an attribute number above 10, they recommend using self-explicated or hybrid approaches. Malhotra (1982: 427) found that evidence of information overload appeared when respondents

were confronted with ten or more alternatives in a choice set or with 15 or more attributes. Moreover, Malhotra (1982: 427) found that the evidence of information overload remains nearly stable between ten and 25 alternatives or 15 or 25 attributes. Thomas (1983: 310) states that the number of attributes should not exceed five and the number of alternatives not exceed 20. These different findings result from the fact that the limitation not only depends on the number of attributes and attribute levels but also on respondent and survey-specific characteristics. These include cognitive complexity (Bieri 1971: 197; Malhotra 1982: 428), socioeconomic status, age, expertise (Bettman & Luce & Payne 1998: 195) as well as the involvement of respondents in the study (Weiber & Mühlhaus 2009: 48).

Bettman & Luce & Payne (1998: 192) concluded that respondents are balancing the demand on and supply with their memory and processing capacity depending on their decision goals, i.e. they compromise between an accurate and an economic decision. Wright (1975: 62) arrives at the same finding and states that decision makers often need to compromise between decision optimisation and simplification. Although it may be tempting to reduce the number of attributes and attribute levels, it needs to be taken into account that a reduction in complexity or an oversimplification of an issue leads to a reduction in the accuracy of discrimination and implies a reduction of information. Therefore, an excessively high reduction of attributes can do more harm than good. The number of attributes remains a trade-off between too many attributes with the risk of overwhelming the respondents with information and too few attributes with the risk of making inferences about omitted attributes (MacLachlan & Mulhern & Shocker 1988: 42).

Third, they need to fulfil the requirements of the underlying decision model:

- Compensatory relationship of attributes:

  The conjoint analysis is based on a linear-additive calculation model; where the entire utility value is the sum of multiple utility values. A higher utility value of one attribute can compensate a lower utility value of another attribute. The attributes should have a compensatory relationship to correspond to the underlying statistical model (Weiber & Mühlhaus 2009: 48). Teichert & Sattler & Völckner (2008: 657) point out that conjoint analysis assumes the existence of a statistical utility model; the assumed model is, however, not checked for validity afterwards. Therefore, whether the statistical utility model actually reflects the respondent's decision behaviour needs to be verified in advance. As to whether a specific conjoint design

complies with this requirement of a compensatory relationship depends on two circumstances.

On the one hand, the relationship can be analysed from a technical perspective of supply chain management. In this regard, the authors of the African Development Bank report "Ports, Logistics and Trade in Africa" (AfDB 2010: 137) state that it is the weakest link that determines supply chain performance. The authors of the World Bank "Africa's Infrastructure" report state that the weakest link of transport chains may be of physical, institutional or operational nature (Foster & Briceño-Garmendia 2010: 204). The authors of the World Bank report "Connecting to Compete" (Arvis et al. 2016: 3) state that one factor cannot completely substitute or replace another factor of supply chain performance. Whilst the first and second statement seem to refer to specific functions or instances of supply chains, the third statement seems to refer to a higher level of aggregation, such as infrastructure and service performance. Following these considerations, at least a partial non-compensatory relationship may occur. At the same time, this implies, however, that to a certain extent, a compensatory relationship between attributes may occur.

On the other hand, the requirement of a compensatory relationship can be analysed from the perspective of a decision maker's applied decision and behavioural model. As indicated earlier, Wright (1975: 60) states that people choose the decision strategy that best meets their situational priorities. Decision makers have to compromise between making the best decision using an optimisation strategy and minimising the decision effort by using simplification strategies. Several factors have an influence on the trade-off between an optimisation and a simplification strategy. First, there is the potential loss of making an inaccurate decision. The higher / lower the potential loss, the more / less accurate the decision process is expected to be. In turn, the more likely an optimisation / simplification strategy is. Then, there are factors that can be summarised as information load. Information load increases with an increasing number of attributes and levels, environmental distractions and time pressure. Wright (1975: 60, 62) has structured the decision models in two dimensions. First, there are processes that determine how individual multi-attribute profiles are evaluated. Second, there are rules that determine how multi-attribute profiles are distinguished. The processes are either compensatory or non-compensatory. In a compensatory process, attribute values average each other using an equal or differential weight model. In a non-compensatory process, attributes do not balance each other; rather, they are traded off by choosing the

best attribute value. The non-compensatory decision models encompass the lexi-cographic, minimax, maximax, conjunctive, disjunctive and sequential-elimination model.[35] In view of the trade-off between optimisation and simplification, an opti-misation strategy requires that information on each multi-attribute combination, at-tribute and level can be taken into account. Whilst this applies to the equal and differential weighted compensatory, conjunctive, minimax and maximax model, this does not apply to the lexicographic, disjunctive and sequential-elimination model. The latter models terminate before a complete trade-off is achieved or ignore low attribute levels and are therefore ill-suited to a decision optimisation (Wright 1975: 61).

Bettman & Luce & Payne (1998: 188) state that for familiar and simple decisions, decision makers may have a well-defined robust preference order. The more novel and complex a decision is, the more likely that decision makers choose a decision strategy and form their preferences in that moment. The more complex a decision and the less time available for a decision making process, the more respondents are tempted to apply decision models that are non-compensatory (Bettman & Luce & Payne 1998: 199, 200). Bettman & Luce & Payne (1998: 189) note that respond-ents may adopt any behavioural model or decision model, whether it is weighted adding, lexicographic, satisficing, elimination by aspect, equal weight, majority of confirming dimensions or any other model. Green & Srinivasan (1978: 107) state that the additive model of the conjoint analysis can approximate decision models, even those other than the compensatory, well. For instance, Teichert (2001: 62) explains that a lexicographic decision behaviour can be emulated using an additive model by assigning higher weight to more important attributes. The additive model

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35   In a lexicographic decision model, first attributes are sorted by importance. Then, all multi-attribute combinations are evaluated on the most important attribute. Afterwards either the combination with the best attribute value is chosen or, when no sufficient differentiation can be achieved, the procedure continues with the second most im-portant attribute. In a minimax decision model the aim is to minimise the maximum loss by rejecting the lowest attribute values. In a maximax decision model the aim is to maximise the maximum gain by successively accepting the highest attribute values. The conjunctive and disjunctive decision models set up a cut-off threshold and attrib-utes that are below- / above-threshold attribute levels are rejected / accepted. In a sequential elimination decision model, attributes are sorted by importance. Then, for each attribute, a cut-off threshold is set and, from the most important attribute on, attribute values below or above the threshold are eliminated until a decision can be made or until all attributes have been evaluated. Detailed explanations of the decision strategies can be found in Bettman & Luce & Payne (1998: 190-192) and Wright (1975: 60-02)

is adjudged to demonstrate a high robustness against non-compensatory decision models (Teichert: 2001: 63). Of course, researchers can assume a particular decision model and, thus, an appropriate statistical utility model; however the statistical model, with its corresponding functional form, is only valid if it conforms to the applied behavioural model of the respondent (Hainmueller & Hopkins & Yamamoto 2014: 3). Since it seems that the applied decision model cannot be ascertained in advance and the linear-additive model can approximate others than a compensatory decision model well, the linear-additive model forms the basis of this conjoint design.

- No criteria for exclusion:

The attributes should not contain any attribute levels that constitute criteria for exclusion. Such attribute levels would lead to a disregard of an attribute set, independent of the actual attribute levels of the remaining attributes. The compensatory relationship would disappear. However, potential criteria for exclusion may, instead of containing any value at all, just as well be rated with very low utility value (Weiber & Mühlhaus 2009: 49). Whilst some studies such as Srinivasan (1988: 296) and Bucklin & Srinivasan (1991: 61) assume non-compensatory decision models for unacceptable attribute levels[36], other studies such as Green & Krieger & Bansal (1988: 298) and Klein (1987) found a minimum compensatory decision behaviour for unacceptable attribute levels. An issue that Klein (1987: 154) points out is whether attribute levels are actually unacceptable or just undesirable in the respondent's opinion. The difference between unacceptability and undesirability is less about a respondent's perceived attribute level inherent characteristic than the respondent's expectation of the alternatives. Klein discovered inconsistencies in the respondents' behaviour in the way that object combinations containing initially unacceptable attribute levels have later been treated in a compensatory manner.

An important issue which shows up when mapping the relevant attribute in each supply chain area is the high number of attributes to be included in the questionnaire design. Louviere (1984: 148) points out that one may argue that the number of attributes in many research instruments is unrealistically large; it should, however, not be ignored that many real world decisions actually show a high degree of complexity.

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36   A two stage conjunctive-compensatory model, as applied in adaptive conjoint analysis

Although there are other conjoint approaches (e.g. adaptive conjoint analysis, pair-wise trade-off conjoint analysis), these alternatives have, as discussed earlier, other substantial weaknesses. Therefore, the fundamental problem of a disproportionate increase in the number of objects compared to the number of attributes and levels still remains (Oppewal & Louviere & Timmermans 1994: 92; Louviere 1984: 148). There are, however, some techniques left to solve the reduction of the number of objects.

First, conjoint analysis, as stated earlier, rests upon a factorial design. A full factorial design consists of all possible attribute level combinations, which allow measuring both the main as well as the interaction effects. Main effects map the utility effect of individual attributes. Interaction effects map the utility value that results from the fact that several attribute levels occur in combination (Teichert & Sattler & Völckner 2008: 661). In a full factorial design all attribute level combinations appear in equal frequencies and are therefore statistically independent (Addelman: 1962: 23). A full factorial design yields the best parameter estimates. However, the number of attribute combinations increases exponentially (number of attribute combinations = M^N) with the number of attributes (N) and attribute levels (M) and real world decision situations often contain many attributes. For this reason in applied sciences, usually only a representative subset of all possible attribute combinations is used. Such a fractional or reduced factorial design can reduce the number of combinations to be considered in a conjoint design and thereby reduce the information to be evaluated by the respondent. For symmetrical designs, there are two basic methods to generate reduced factorial designs (cf. Backhaus & Erichson & Weiber 2013: 272-273). First, the randomisation method selects attributes and attribute levels randomly, and therefore does not produce stable results. Second, attributes and attribute levels can be reduced to an orthogonal design; that is a design, which complies with the condition of equal proportional frequencies and therefore statistical independency of attributes and attribute levels. This is a less stringent condition than the equal frequencies of attribute and attribute levels of a full factorial design (Addelman: 1962: 23-24). For factorial designs with up to three attributes, relatively simple construction methods can be applied. For designs with more than three attributes and asymmetrical designs, the construction of an orthogonal design is more extensive. In order to reduce the construction effort auxiliary plans such as Addelman's "Basic Plans" (Addelman: 1962: 23-27) are applied (Backhaus & Erichson & Weiber 2013: 274).

Second, a pooling of multiple attributes into a higher order attribute by means of Hierarchical Information Integration (HII) could bring a further reduction of objects. HII

is based on the information integration theory (cf. Anderson 1981) according to which individuals tend to pool pieces of information in larger sets in order to reduce the number of individual attributes and thereby allow a comprehensive evaluation of alternatives (Louviere 1984: 148). The procedure of an HII approach is two-staged. First, respondents rate a construct, i.e. a set of sub-attributes from overall attributes, on a numerical scale. Second, respondents are presented with the constructs with differently predicted scores. They are instructed to suppose that these scores match the rating scale on which the respondents based their preceding attribute rating. With that in mind, respondents rate their preference for the attribute constructs (Louviere 1984; Louviere & Gaeth 1987: 30-32). By doing so, a high number of attributes is concatenated to a many-to-one hierarchical relationship. However, Oppewal & Louviere & Timmermans (1994: 94) identified a list of limitations of the HII approach, such as the necessary bridging task in order to obtain a single model. Therefore, Oppewal & Louviere & Timmermans (1994) suggested an extension of the original approach, the integrated HII. The integrated HII creates a single model by including the higher order attributes into the sub-attribute designs and thereby eliminates the need for bridging.

Based on the literature review, by means of a mindmap and spreadsheets and in due consideration of the above mentioned requirements, five attributes per supply chain component that are expected to be important and determinant for each component have been selected. Several fractional factorial designs with a varying number of attributes were tested. It turned out that five attributes represent a feasible limitation and, at the same time, are able to represent each supply chain domain adequately.

In the course of the attribute structure design, two aspects seemed relevant. First, despite availability of information on specific attribute performance, differences in details may render reasonable comparisons impossible. Second, respondents may construct attributes in the background; the underlying attributes may vary respondent to respondent. Different stakeholders may have different criteria to evaluate attribute performance. With this in mind, the attribute structure is designed in the following way: First, because comparability and aggregation across respondents and reference objects is important, the attributes are named as specifically and, at the same time, as generically as possible. The attribute name sets the boundaries to other attributes. Within the scope of attributes, it is left open to the respondent to associate details. This is expected to ensure comparability and appropriateness of aggregation even if underlying details vary. Second, because this research aims to identify factors that

constrain supply chain performance, functional aspects are at the centre of interest. Thus, the attributes names refer to functions and do not contain performance indicators, such as quality, state, number, capacity, depth, width, reliability, timeliness, costs and speed. An overview of the attribute structure for each of the four supply chain domains, i.e. seaports, road transport networks, rail transport networks as well as manufacturing locations is provided in Table 3-2 below.

Nonetheless, because of the large scope of each supply chain area, to ensure a common understanding of the attributes, there is either a need for attribute subsets according to the HII, integrated HII or an alternative solution. To avoid a further extension of the questionnaire scope, complexity and completion time, instead of individual subset conjoint designs, an explanation of the attributes is used. This procedure is expected to provide respondents with a consistent set of sub-attributes, with the option of associating additional sub-attributes, and thereby create a uniform definition across respondents. Each of the attributes shown below is explained by five sub-attributes. In the questionnaire, this list of sub-attributes is designed as a mouse-over function in order to minimise the space needed to provide the information as well as the initial information load. The list of sub-attributes or examples is referred to as "attribute examples". This points to the fact that this list is not exhaustive and within the scope of the attribute further examples could be assigned. Identical to the attributes, the attribute examples are worded as functional factors without explicitly referring to performance indicators.

Table 3-2: Attributes by Supply Chain Domain

Supply Chain Domain	Attributes
Seaports	Infrastructure
	Operations
	Public Policies and Services
	Seaward Accessibility
	Landward Accessibility
Road Transport Networks	Infrastructure
	Equipment and Facilities
	Transport Operations
	Public Policies and Services
	Transshipment Centres
Rail Transport Networks	Infrastructure
	Equipment and Facilities
	Transport Operations
	Public Policies and Services
	Transshipment Stations
Manufacturing Locations	Local Infrastructure
	Manufacturing Sites
	Public Policies and Services
	Economic Agglomeration
	Transport Network Accessibility

The attributes and sub-attributes, or stated in the wording of the questionnaire examples, of the four supply chain domains are shown in Table 3-3, Table 3-4, Table 3-5 and Table 3-6 below.

Table 3-3: Seaport Attribute Structure

Do-main	Attribute	Sub-Attributes (Examples)
Seaports	Infrastructure	Port layout, port basins, turning circles, quays, piers, berths
		Cargo inspection, storage and receipt / dispatch areas and facilities
		Data transmission infrastructure, information and communication
		Transshipment and transport equipment – ship to shore, yard handl.
		New investment, maintenance and rehabilitation of infrastructure
	Operations	Navigation, piloting and (un-)mooring services
		(Dis-)charging, yard handling, (de-)consolidation, inventory
		Customs procedures, veterinary procedures
		Seaport service providers, in-port competition
		Educated workforce
	Public Policies and Services	Long- and medium-term seaport planning
		Implementation of public policies and services
		Funding of investment in infrastructure
		Tariff and user charge setting
		Import, export and transit regulations
	Seaward Accessibility	Access to shipping networks
		Access channels
		Fairways, e.g. length, depth, width
		New investment and maintenance of fairways
		Weather dependency, e.g. tidal range
	Landward Accessibility	Access to road, railway and inland waterway networks
		Strategic development of transport links
		Companies and industries located next to seaport
		Public authorities located next to seaport
		Educational and research entities located next to seaport

Table 3-4: Road Transport Network Attribute Structure

Domain	Attribute	Sub-Attributes (Examples)
Road Transport Network	Infrastructure	Roads, lanes, bridges, road network, border posts
		Service and petrol stations
		Data and power transmission infrastructure
		Traffic routing measures and system
		New investment, maintenance and rehabilitation of infrastructure
	Equipment and Facilities	Transport vehicles
		(Un-)Loading devices
		Transport units
		Information and communication software systems
		New investment and maintenance of equipment and facilities
	Transport Operations	Road freight operations
		Organisation and frequency of transports
		Control en route/ road block operations, border operations
		Operating road transport companies, competition
		Educated workforce
	Public Policies and Services	Long- and medium-term road network development
		Implementation of public policies and services
		Funding of investment in infrastructure
		Road freight tariff and user charge setting
		Import, export and transit regulations
	Transshipment Centres	Intra-modal (off-)loading facilities
		Inter-modal (off-)loading facilities
		Cargo transshipment services
		Inventory and value added services
		Access to road and railway network

Table 3-5: Rail Transport Network Attribute Structure

Domain	Attribute	Sub-Attributes (Examples)
Rail Transport Network	Infrastructure	Tracks, points, bridges, signalling, rail network
		Power supply for rail infrastructure
		Border posts
		Data transmission infrastructure
		New investment, maintenance and rehabilitation of infrastructure
	Equipment and Facilities	Locomotives and waggons
		Transport units
		Power supply for rail fleet
		Information and communication software systems
		New investment and maintenance of equipment and facilities
	Transport Operations	Rail freight operations
		Organisation and frequency of transports
		Border operations
		Operating rail transport companies, competition
		Educated workforce
	Public Policies and Services	Long- and medium-term railway network development
		Funding of investment in infrastructure
		Implementation of public policies and services
		Rail freight tariff and user charge setting
		Import, export and transit regulations
	Transshipment Stations	Intra-modal (off-)loading facilities
		Inter-modal (off-)loading facilities
		Cargo transshipment facilities and services
		Marshalling facilities and operations
		Access to road and railway network

Table 3-6: Manufacturing Location Attribute Structure

Domain	Attribute	Sub-Attributes (Examples)
Manufacturing Location	Local Infrastructure	Road infrastructure
		Rail infrastructure
		Electrical power supply infrastructure
		Data transmission infrastructure
		New investment, maintenance and rehabilitation of infrastructure
	Manufacturing Sites	Manufacturing equipment, practices and processes
		Information and communication software systems
		Educated workforce
		Investment in manufacturing sites
		Research and development activities
	Public Policies and Services	Long- and medium-term location development
		Implementation of public policies and services
		Regulation of manufacturing operations and practices
		Regulation of trading operations and practices
		Labour regulation and development
	Economic Agglomeration	Volume of local manufacturing activities and output
		Diversity of locally operating companies
		Ubiquity of locally operating companies
		Location of companies in industries, previously not present
		Locally based educational and research entities
	Transport Network Accessibility	Access to seaports
		Access to international road and rail networks
		Access to international air networks
		Access to international inland waterway networks
		Supply with foreign input goods and services

Selection of Attribute Levels

Once a decision has been made on the attributes to be included, the attribute levels can be determined. The attribute characteristics already set out the frame of how the attribute levels can be configured. There remain, however, some criteria on attribute level representation form and attribute level measurement properties to be considered (MacLachlan & Mulhern & Shocker 1988: 43).

Attribute levels can be represented in various dimensions. The dimension of representation determines whether the attribute levels are described in script, e.g. verbally or numerically, or as a diagram, e.g. figurative or pictorial (MacLachlan & Mulhern & Shocker 1988: 43). Attribute levels can be described by features, that is, the availability or non-availability of an attribute level, or by dimensions, i.e. attribute levels on a continuous scale (Garner 1978: 102-104). The scope of attribute level descriptions can vary from comprehensive to sparse (Johnson & Fornell 1987). The attribute description can be precise or abstract. On the one hand, more precise descriptions provide more detailed information about the attribute levels. On the other hand, precise descriptions may – due to their higher information content – require processing more information and therefore, compared to abstract descriptions, can be more straining to trade-off. It should also be noted that the task to trade-off the attribute level combinations becomes more difficult, the more difficult it is to compare the levels (Bettman & Luce & Payne 1998: 189). Thus, the attribute labelling is not only a question of degree of detail but also of comparability. The reference point of attribute levels can be either identical for all respondents, respondent-dependent or even be missing (Weiber & Rosendahl 1996: 568). Finally, it should be noted that despite an identical representation, an attribute level may suggest different perceptions to different respondents and thereby convey different meanings (MacLachlan & Mulhern & Shocker 1988: 46).

In addition to the representation criteria, Weiber & Mühlhaus (2009: 54) name further criteria that need to be fulfilled. First, the attribute levels need to be determinant that is, a change in an attribute level should result in a change of preference of the respondent. Second, the attribute levels should be in a relative relationship in order to be traded-off. Third, there should be no unrealistic attribute levels, which let the respondent be in doubt about the accuracy. Finally, there should be no criteria for exclusion.

Below the line, the dimension, the scope and accuracy of the representation as well as the reference point should be chosen depending on what best conveys the meaning. Much as the selection of attributes, the selection of attribute levels is a balancing act between focussing only on the most relevant information and keeping the decision situation as close to real world decisions as possible (MacLachlan & Mulhern & Shocker 1988: 42).

Provided the envisioned attribute levels comply with the above-mentioned criteria, the number of attribute levels needs to be decided on. From interviewer's, decision maker's or user's requirements perspective, the number of levels should be preferably large in order to provide detailed information. From the interviewee's point of view, the number of levels should be preferably small. First, this is because the more levels considered, the more the interviewee needs to be familiar with the issue to be dealt with and the more expertise is demanded from the respondent (Weiber & Mühlhaus 2009: 54). Second, the more levels considered, the more time it takes to trade off the alternatives. Then there are some level effects, which need to be taken into account: In decision situations, where only the range of levels of an attribute varies, it should be expected that the attribute with the smaller / higher range of attribute levels receives a lower / higher relative importance – referred to as bandwidth effects (Gedenk & Sattler 2009). In decision situations where the number of attribute levels vary from attribute to attribute, it should be expected that the relative importance decreases / increases with a decreasing / increasing number of levels – referred to as number of levels effect. The number of levels should preferably be held constant (Wittink & Krishnamurthi & Reibstein 1989). In decision situations where attributes are either shown as single attributes or split into sub-attributes, it should be expected that respondents assign a higher relative importance to attributes split into multiple sub-attributes. For this reason, if attributes are split into sub-attributes, the number of sub-attributes should preferably be identical – referred to as splitting effects (Weber & Eisenführ & Winterfeld 1988).

In this conjoint design, the attribute levels are represented dimensionally and verbally. The level descriptions are rather sparse and abstract. The attribute levels do not have a reference point. For all areas and attributes, they range from good, and fair to poor. The levels are symmetrically designed. The symmetrical and consistent design is expected to prevent bandwidth, number of levels as well as splitting effects. This simple and standardised attribute structure has several advantages: First, it provides a

means to holistically describe the performance of the attributes without explicitly re-
ferring to all specific individual attribute levels or the risk of listing only a few, e.g. the
mere focus on costs, time or absence of errors. Second, their uniformity facilitates the
inter- and intra-attribute comparability and thereby facilitates trade-off decisions.
Third, despite their simplicity and standardisation, it is expected that this attribute level
design provides sufficient information to differentiate between the performance levels.

Through the various considerations and techniques, a conjoint design encompassing
five attributes, five sub-attributes and 14 attribute-level objects has been attained. It
is expected that this design represents a balance between precision and aggregation.

In order to ease the differentiation between the attribute levels, the verbal descriptions
are placed against a coloured background. The traffic light colour scheme of green,
orange and red seems appropriate here, since it applies to all four countries and re-
spondents can be assumed to be used to it. A sample multi-attribute object is depicted
in Figure 3-1 below. A presentation of the questionnaire, including the performance
measuring instrument, follows in section 3.2.1.3 as well as the appendix publiation.

Figure 3-1: Sample Stimulus 1

Seaport 1				
Infrastructure	Operations	Public Policies and Services	Seaward Accessibility	Landward Accessibility
Fair	Poor	Good	Good	Poor

To design the fractional factorial design and, based on the preference ranking of the
respondents, to calculate importance values, the statistical Software SPSS is applied.
By means of a multivariate linear regression, the software calculates part worth utili-
ties for each respondent. Then, these part worth utilities are standardised across data
sets and aggregated into overall part worth utilities. The more value respondents
place on an attribute, the more they tend to differentiate between attribute levels.
Based on the range from the lowest to the highest part worth utility of each attribute
level, importance values are calculated. For instance, whilst small differences in part
worth values across attribute levels indicate a low importance, high differences in part
worth values indicate a high importance to the respondent(s). Because a detailed de-
scription of the mathemathical procedure that SPSS applies and application to calcu-
late importance values would not provide additional value to the research objective,
at this stage, the interested reader is referred to the product manual (cf. IBM 2014a:

118-122; 2014b). To assess the goodness of the estimated parameters, the rank correlation coefficient, Kendall's Tau, is specified and interpreted for each result.[37]

3.2.1.2 Performance Measuring

To obtain information on the performance of factors of supply chain performance, the respondent's attitude towards factor performance could be measured. To take up the discussion on validity of stated and revealed data, one may argue that the measurement of performance should solely rely on fact-based instead of perception-based data. However, Kaufmann & Kraay & Mastruzzi (2010: 18) indicate that fact-based data may not be available and, thus, perception-based data may remain the only option. In addition, Kaufmann & Kraay & Mastruzzi (2010: 11, 18) point out because fact-based data may differ from factual situations, fact-based data may only be an imperfect substitute of real world situations. Kaufmann & Kraay & Mastruzzi (2010: 18) emphasise that stated perceptions and opinions matter because decision makers make their decisions based thereon. Against these arguments, it seems reasonable to rely on perception-based data. To get there, a survey scale may provide a solution.

3.2.1.2.1 Survey Scale

Johnson & Morgan (2016: 13, 229) defined a survey scale as an instrument consisting of closed-response items to measure a construct. Survey scales can be used to capture information on attitudes, knowledge and behaviour. Similarly, Babbie (2016: 156, 174) defines a scale as a type of composite measure[38] consisting of several items that feature a logical or empirical structure. Survey scales to measure attitudes encompass the Thurstone scale, semantical differential as well as the Likert scale.

3.2.1.2.2 Likert-type Scale

A scale that seemed well suited due to its characteristics is the Likert scale. A Likert scale is a commonly used scale to measure attitudes (Johnson & Morgan 2016: 5). In its original design, Rensis Likert (1932: 14) formed a series of propositions and pro-

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37   Kendall τ rank correlation coefficient calculates the correlation between the observed ranks and the predicted ranks. Predicted ranks are calculated from the estimated part worth values. Kendall τ is standarised, i.e. the direction and strength of linear relationship varies between minus 1 and plus 1, where minus one indicates a perfect negative and plus 1 a perfect positive correlation (cf. Kendall 1962; IBM 2014a: 122, 641-643).

38   An alternative composite measure is an index (Babbie 2016: 156). Indices to measure the performance of supply chain components were presented in section 2.4.

vided five point-statements ranging from complete agreement to complete disagreement. To each proposition, respondents expressed their disposition in direction and intensity by choosing one of the five-point statements. In contrast to its original design with a series of similar items, a design with only a few items or even a single item is frequently used. Hence, it is aptly named a Likert-type or -style scale or item (Albaum 1997: 332; Johnson & Morgan 2016: 5). The fact that the original Likert scale is frequently used as a Likert-type scale or item brings about some disputes on its actual level of measurement among scholars (cf. Marcus-Roberts & Roberts 1987; Knapp 1990). The existing level of measurement is usually judged by Stevens' theory on the scales of measurement (Stevens 1946). On the one side, there are scholars such as Kuzon & Urbanchek & McCabe (1996: 266) and Jamieson (2004: 1217) who argue that response statements can be ordered in a meaningful manner but cannot be assumed equidistant to each other. Therefore, the resulting response data only suffices an ordinal level of measurement. On the other side, there are scholars such as Carifio & Perla (2007: 115) and Knapp (1990: 123) who argue, provided that the response statements have an arbitrary zero point and a constant unit of measurement, a Likert-type scale or item can be treated at an interval level of measurement. Proponents of treating a Likert-type scale or item at an interval level of measurement, besides the existence of an arbitrary zero, place high value on the fact that respondents can be assumed to perceive the scale points as equidistant. At a certain point, a higher number of response point statements could provoke a perceived shift from a discrete to a quasi-continualisation of the scale and thereby support equidistance of intervals between scale points (Knapp 1990: 123). Even Stevens (1946: 679) points out that as long as ordinal scale points have intervals of equal size, the use of interval scale statistics may be arguable. Stevens (1946: 679) thereby provides a justification for psychometrically-oriented scientists who prefer to loosen the statistical rules for the sake of meaningful results (Knapp 1990: 123). It should only be mentioned in passing that in addition to the disagreements between psychometrically and statistically-oriented scientists (Knapp 1990: 121), part of the disputes also stems from an ongoing confusion of a Likert scale and a Likert-type scale or item (Carifio & Perla 2007: 109).

To set the course for a richer database and more meaningful data analysis, the Likert-type items are designed to be equipped with an arbitrary zero and perceived equidistance between the point statements. To achieve this, each item consists of a briefly stated and clearly positive proposition response statement, six response statements as well as a default category. A proposition is written as follows: "The [attribute] is /

are very good." The response statements range from "I strongly agree" to "I strongly disagree" as well as "I don't know". The positively worded proposition "very good" along with the response statement "I strongly agree" establish the arbitrary zero from which all other response statements unidirectionally deviate up to the scale point "I strongly disagree". The response statement's end points are verballly and numerically denoted; the scale points in between are numerically denoted only. This should make the respondents perceive the response statements as quasi-continuous and thereby equidistant to each other. The default category "I don't know" allows the participants to avoid an evaluation of the performance, in the case of non-ability or unwillingness to make a statement. This non-decision option should enhance the information validity.

Five items measure the performance of each domain or construct. The wording of response statements is standardised and only the attributes differ. Each supply chain domain covers five attributes and, in turn, five response statements. The attributes of the response statements are identical to the attributes of the conjoint analysis. Put differently, the attributes of the importance-measuring instrument are identical to the attributes of the performance-measuring instrument. This allows for comparisons.

3.2.1.3 Questionnaire

A standard but capable survey tool forms the basis of the online questionnaire. Considerable amendments were made to implement the envisioned questionnaire design. Well in advance of the go-live of the online survey in May 2016, two pre-tests were conducted. A first pre-test was carried out from May to June 2015. A second pre-test was conducted from October 2015 to January 2016. Experts in the area of logistics and manufacturing were asked to complete the online questionnaire and provide feedback. About 20 experts from Namibia and Germany provided feedback on the questionnaire. Despite strengths, their feedback showed that the questionnaire had weaknesses in terms of usability and cognitive demands. In consequence, a multitude of changes were made to improve the questionnaire.[39] First, before respondents provide information, they may wish to get basic information on the research project. To equip the respondents with essential information on this research project, the questionnaire as well as the researcher, a 2-minute video introduction was produced and placed at the beginning of the questionnaire. Second, due to the low number of tasks and high

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39   A holistic illustration of the questionnaire is provided in the appendix publication.

amount of completion time per task, respondents may struggle to correctly assess the completion time per tasks as well as the remaining completion time. In the worst case, repondents may decide to drop out. To allow respondents to assess the estimated completion time per task as well as the remaining completion time more accurately an estimated time and a progress bar were provided. Third, the pre-test showed that most respondents are not familiar with a ranking task in an online questionnaire, as depicted in Figure 3-2 below. Add to that the high amount of information that is necessary to complete the task. To provide a useful task description, a separate task description page was set up and placed before the ranking task. To complement the verbal description, a video instruction on the drag and drop ranking was produced and provided.

Figure 3-2: Ranking Task

To create and maintain an identical understanding of how each attribute is defined, a mouse-over function for each attribute with five example sub-attributes was implemented. The mouse over function is not only available in the preparation task, but in the importance ranking and performance rating task later on as well, as shown in Figure 3-3 below.

Figure 3-3: Likert-type Items

To ensure that the questionnaire communicates clearly, conforms to language conventions and does not contain typographical errors, a native speaker in British English was consulted during the design phase, as well as reviewed and finally approved the questionnaire. To ensure that even in case of low internet bandwidth the video can be viewed, the video quality has been reduced to a low but still adequate quality.

3.2.1.4 Method of Analysis

In quantitative research, the procedure to analyse the information is largely determined during the design phase of the instrument. Standard statistical software, as explained in the previous section, is used to prepare the data for analysis.

The aggregated data will be presented in diagrams and described as well as interpreted. An aspect, which still requires attention, is how the importance and performance values are interpreted to draw conclusions on their effect on further improvements of supply chain performance. First, as initially contemplated, importance and performance values could be considered with an equal share. The higher the importance and the lower the performance, the more likely it is that an attribute represents a binding constraint. Second, alternatively, if greater allowance is made to non-compensatory mechanisms among attributes, the lowest performing attributes could receive a higher weight. Because of their low performance, these attributes may exert a constraint on the overall supply chain domain performance. Moreover, what remains to be answered is how to deal with similar importance and performance values. Consequently following the growth diagnostics approach would suggest that further information is necessary to correctly assess which attribute is more constraining than the

other. This consideration will be discussed more thoroughly at a later stage, in section 6.3.1.1.

3.2.2 The Qualitative Method

The research method has already pointed to open-response surveys, i.e. qualitative interviews, as a second major method to obtain the necessary information on potential constraints of supply chain performance.

3.2.2.1 Qualitative Interviews

In contrast to their quantitative counterparts, qualitative interviews aim at capturing a limited, broad range of subjective, interviewee defined responses (Bogner & Littig & Menz 2014: 24).

The type of knowledge that is aimed at decides on the type of interview that is applied. Bogner & Littig & Menz (2014: 17-22) distinguish between three main types of knowledge – process, interpretive and technical knowledge. Process knowledge results from an individual's experience with and insight into processes, procedures, interactions and events. Interpretive knowledge results from an individual's evaluations and opinions on facts and situations. Athough these two types of knowledge are subjective and person-bound in nature, process and interpretive knowledge may just as well be shared among individuals. Because of their subjective and individual nature, expert interviews are well-suited to capture process and interpretive knowledge. Technical knowledge results from facts and actual situations. This type of knowledge is objective and independent from individuals. Since experts may not be knowledgeable, not well-informed or be wrong about facts and actual situations, expert interviews do not lend themselves to capturing technical knowledge. Methods, other than qualitative interviews, are suited to capture technical knowledge. Although the particular strength of qualitative interviews lies in capturing interpretive knowledge, qualitative interviews usually embrace all three types of knowledge. Irrespective of the above-mentioned suitability of types of knowledge, qualitative interviews may turn out to be an appropriate method if no other method of data collection is available. To a certain extent based on the same material, the research design decides which type of knowledge is of central interest (Bogner & Littig & Menz 2014: 17-22). Similarly, Meuser & Nagel (2005: 75-76) distinguish between operational and contextual knowledge. Operational knowledge results from an insight into processes to solve social problems. Contextual knowledge results from information on general socio-

economic factors. Whilst getting insight into processes requires an involvement of experts, information on general socio-economic factors is often available to a larger, public audience. The particular strength of qualitative interviews lies in capturing operational knowledge. Nonetheless, since qualitative interviews with a focus on contextual knowledge often also reveal information, which is not exposed to a larger, public audience, qualitative interviews may be of value in case of contextual knowledge as well (Kaiser 2014: 26, 45).[40]

The type of the qualitative interview depends on what the researcher wants to achieve. Bogner & Littig & Menz (2014: 22-25) distinguish between explorative and comprehensive qualitative interviews. First, explorative qualitative interviews serve to explore a subject or field of knowledge in order to provide a basic orientation, a refinement of a problem or a hypothesis. Explorative interviews are often used to collect process or technical knowledge, but may just as well be used to provide a basic orientation of interpretive knowledge. The questioning is done as openly as possible to ensure an exploitation of a subject or field of knowledge. It is not the aim of explorative qualitative interviews to close specific knowledge gaps. They can be used as a standalone or complementary method. Second, comprehensive, qualitative interviews serve to collect extensive and complete information on a research problem, either as a systematising or theory-generating expert interview. Systematising expert interviews consider the interviewees' statements as objective information. Their focus is on process and technical knowledge. Theory-generating interviews consider the interviewees' statements as subjective information. Their focus is on interpretive knowledge. For this reason, a theory-generating expert interview can clearly be regarded as a qualitative method. Systematising and theory-generating interview types are pursued in this research.

A major criterion for differentiation of interview type is, according to Gläser & Laudel (2010: 41-42), the technique that is applied to capture the information. First, completely standardised interviews consist of prescribed wording and ordering of questions as well as prescribed response options. Because of their complete prescription and standardisation, completely standardised interviews tend to belong to quantitative research. Qualitative interviews do not require a strict standardisation of questions. Questions should rather be adapted to the conversation and interviewee in order to

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40   It could also be differentiated between tacit and explicit knowledge (Polanyi 1958), as Kaiser (2014:46) points out.

allow for a comprehensive and adequate examination of the research problem. Partly standardised interviews consist of a prescribed wording and ordering of questions as well as non-prescribed response options. This type of interview acknowledges that there are specifications to which the interviewer needs to stick in order to obtain the relevant information. Partly standardised interviews include guideline, open and narrative interviews. Guideline interviews make use of a list of non-mandatory topics and questions. Open interviews only make use of a list of non-mandatory topics. Narrative interviews are introduced by a question that intends to elicit a comprehensive response; shorter questions are used to clarify or refine responses.

Of the partly standardised interviews, the guideline interview is often applied since it brings a number of advantages. First, the interview guideline translates the research questions into questions that allow the respondent to understand the questions as well as, based thereon, to provide the relevant information (Gläser & Laudel 2010: 113). Second, the interview guideline allows the pre-structuring of the interview and provides assistance to the actual interview. Third, the guideline helps to ensure that all relevant aspects are addressed (Gläser & Laudel 2010: 43; Bogner & Littig & Menz 2014: 27). Depending on the type of comprehensive interview, whether it is systematising or theory-generating, the interview guideline is either fine or coarse-grained, varying from a topic guide to a fully-fledged list of questions. The interview guideline is structured into sections, consisting of main and additional questions (Bogner & Littig & Menz 2014: 24, 25, 28).

Proponents of qualitative research methods may argue that interviews that rest upon an interview guideline often do not adequately embrace the principle of openness as well as the aim of non-influencing of interviewees. Thus, in their opinion, in many cases interviews that rest upon an interview guideline cannot be regarded as a qualitative research method. Since a common definition of an expert interview does not exist and the individual design of an expert interview follows its purpose, their argumentation and words of warning are reasonable. However, it needs to be pointed out that there are a great number of types of expert interviews. Their respective design decides on whether a specific interview type complies with the characteristic of a qualitative method and qualitative interview (Bogner & Littig & Menz 2014: 3, 9). Provided that the interview guideline only serves to guide the conversation and the questions are adapted to the respective conversation, expert interviews that rest upon an interview guideline comply with the principles of openness and aim of non-influencing of interviewees. Kaiser (2014: 33, 34) argues that a basic thematic guidance is inevitable

to ensure that the interviewee sticks to the topic and relevant questions. Bogner & Littig & Menz (2014: 30) point out that an upfront provision of the interview guideline may be considered. An upfront provision would allow interviewees to prepare themselves for the interview. Whilst this could be conducive to systematising interviews with a focus on objective information, it could be detrimental to theory-generating interviews with a focus on subjective, spontaneously constructed information. An upfront provision may just as well be required by interviewees. This research project made use of a topics guide, which was sent to interview partners upfront on request.

3.2.2.2 Interview Guideline

The interview guideline is structured in four sections and consists of 15 questions. First, the lead-in to the theme section leads the interviewee and interviewer to the topic. Second, the analysis of the state section intends to make the interviewee describe the state of performance as well as to ponder on the effects and their causes. Third, based on the specified aspects, the identification and development of actions for improvement section intends to work out improvement approaches. Fourth, once the interviewee is familiar with the topics and has provided his or her view and reasoning, the lead-out section provides the interviewee with the option to further leave the track of questions and provide additional information, which might be relevant for this topic from their view. The structure of the interview guideline is shown in Figure 3-4 below.[41]

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41   The interview guideline is illustrated in the appendix publication.

Figure 3-4: Structure of the Interview Guideline
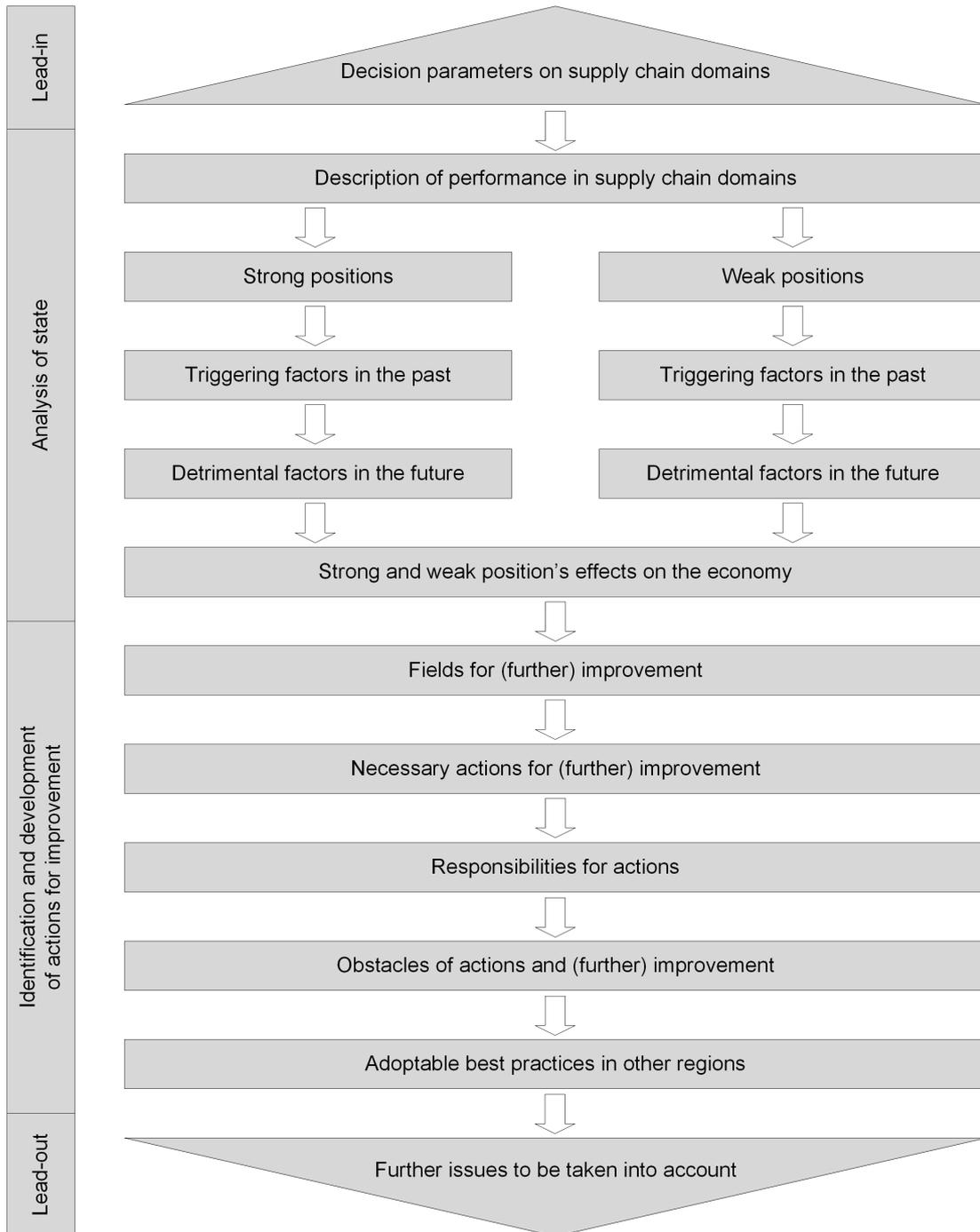
1. How do you make your decisions on the choice of [supply chain (SC) area; more specific e.g. seaports, road transport routes, rail transport routes, manufacturing locations]?

   The question serves two purposes. First, it aims at allowing interviewees to map the interview topic and to give an idea of the following questions. Second, it aims at obtaining information on the factors that determine decision maker's choice on seaports, route and modal options of road and rail transport and locations of manufacturing activities. This information is used to assess the validity of the importance and performance-measuring instrument.

2. How would you describe [country's] current [SC area] performance?

   Without any prescribed direction by the interviewer, interviewees can portray how they perceive the performance of a supply chain area in their selected country. This question is an unbiased precursor of the following questions on strong and weak positions.

3. Where do you see [country's] [SC area] strongly positioned?

   Question three sets the direction of interviewee's answers by asking where they perceive the country strongly positioned in terms of the supply chains area. Strongly positioned is explained by performance in factors that are above the country's or region's average performance. Even though the focus of this research is on weaknesses, more precisely constraints, the view is held that information on strengths helps to discard ideas on spurious constraints and provides information for logical reasoning on causes of constraints. In addition, a positive question at the beginning is expected to send a signal to the respondent that the interviewer also pays attention to and acknowledges achievements, strengths and improvements in a country, not just weaknesses and deteriorations.

4. Which actions or lack thereof has led to this strong position?

   Question four aims at making interviewees think about whether there are any critical junctures, e.g. specific actions, events or points in time, which were conducive or have led to the formation of the strong position.

5. In any of these strong positions, do you fear deteriorations?

   Question five wants interviewees to look at shifts that could make a strong position to deteriorate in the future.

6. Where do you see [country's] [SC area] weakly positioned?

    At the same structural level as question three, yet in the opposite direction, question six asks interviewees where they perceive the country weakly positioned in terms of the supply chain area. Weakly positioned is explained by performance in factors that are below the country's or region's average performance.

7. Which actions or lack thereof has led to this weak position?

    Identical to question four, yet in the opposite direction, question seven aims at making interviewees think about whether there are any critical junctures, e.g. specific actions, events or points in time, which were conducive or have led to the formation of the weak position.

8. In any of those weak positions, do you see any progress?

    Question eight wants interviewees to look at shifts that could make a weak position alleviate in the future.

9. What consequences does this have on competitiveness of the economy?

    Question nine aims at finding out which effects interviewees expect from these strong and weak positions as well as deteriorating and advancing factors. It is assumed that interviewees put historical situations and development as well as expected deteriorations and advances together and develop a future scenario, an extrapolation.

10. Which fields for improvement or further improvement do you see?

    The preceding questions have carved out the characteristics of supply chain performance. Coming from there, question ten takes this whole host of characteristics up and wants the interviewees to specify their most important areas for improvement.

11. Which actions are necessary to do so?

    Whilst question 10 only asked for areas for improvement, questions 11 aims at learning about the measures.

12. Who is responsible for initiating these actions?

    To put actions into practice, there is a need for clarifying the responsibility of at least the initiation of those actions. Question 12 aims at getting to know the interviewees views on the responsibility of the initiation of actions.

13. Which obstacles do you see?

It is assumed that weaknesses that are eliminated or alleviated generally allow for further improvements in supply chain performance. However, constraints may continue to exist, if specific factors maintain this state. Actions may be kept from initiation and realisation because of specific obstacles. With regard to the actions mentioned, question 13 asks interviewees which obstacles they fear.

14. When you look at other countries' (e.g. your neighbouring and other SADC countries') [SC area], is there any condition or practice you would like to adopt in your country?

For the identification of actions for a further improvement of supply chain performance, there is possibly no need to create completely new ideas, rather a look at existing success stories could provide value. Other regions or countries within southern Africa, on the African continent, countries under similar circumstances could already have implemented a solution, which has been proved to work. For this reason, question 14 asks interviewees to think about adoptable best practices.

15. Is there any question you would have expected, which I did not ask?

Up to now, the interviewer's questions have set the direction to the interviewees' answers. However, interviewees may have further information, which they perceive as relevant for this research but which lies on the edge or outside of the prescribed frame of questions. Since interviewees now know well what this interview is about, they are able to evaluate which aspects have not been covered so far or could provide additional information. Therefore, the interview rounds off with an open question for interviewees' remarks.

3.2.2.3 Method of Analysis

In contrast to quantitative research, in qualitative research, the method to analyse the information is largely dependent on the resulting information. The information is often fuzzy. The information may be difficult to interpret, may contain irrelevant information and even contradictory information. This makes qualitative methods of analysis a challenge. In qualitative research, the analysis is less an execution of a prescribed procedure, but rather a creative process of analysis (Gläser & Laudel 2010: 16-17, 43).

There are a number of methods to analyse qualitative information. First, when text is read, interpreted and summarised to respond to the research questions it is referred to as loose interpretation. Second, when information is analysed for links in content or time it is referred to as sequence analytical methods. Third, when text is coded and structured in order to detect text passages that address particular issues it is referred to as grounded theory or coding. Fourth, when information is analysed for relevant information, relevant information is extracted and then used to respond to the research question it is referred to as qualitative[42] content analysis. Whilst loose interpretation, sequence analytical methods and grounded theory run their analysis on the original text, qualitative content analysis runs its analysis on the extracted text (Gläser & Laudel (2010: 44-47). Gläser & Laudel (2010: 200) state that qualitative content analysis is the only qualitative text analysis method that leaves the origin text and reduces the amount of information systematically at an early stage in order to create an extract that is aligned towards the research question.

Because loose interpretation, sequence analytical methods and grounded theory run their analysis on the original text, these methods lend themselves to interpretive knowledge. Because content analysis runs its analysis on the extracted text, it lends itself to process and technical knowledge. Because of their type of knowledge, expert interviews are often analysed by means of qualitative content analysis (Gläser & Laudel 2010: 47). Consequently, since the focus of the qualitative interviews is mainly on process knowledge, qualitative content analysis is applied.

To analyse the interviews afterwards, the interviews need to be documented adequately. Bogner & Littig & Menz (2009: 39) state that because of economic considerations, both under as well as overdocumentation should be avoided. However, underdocumentation limits the analysis already from the beginning on. To analyse the interviews afterwards, Gläser & Laudel (2010: 192) state that the interviews need to be recorded, e.g. by means of a voice recorder. If interviewees disagree to a voice recording, the interviewer needs to take notes during the interview and reconstruct the interview afterwards. Recorded interviews should be transcribed completely. Memory minutes and partial transcritption imply an uncontrolled and intransparent reduction of the information and should therefore be avoided. Gläser & Laudel (2010: 193) point

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42   As opposed to quantitative content analysis, which aims to capture the frequency of categories in text in order to deduce their significance. Although quantitative content analysis aligns the categories with the text material, is still aims to capture frequency instead of extracting information (Gläser & Laudel 2010: 198; Kuckartz 2016: 13-15).

out that since the transcription of interviews is highly time-intensive the option for transcription needs to be evaluated at an early stage of a research project.

On the basis of transcripts, qualitative content analysis can be applied. In its core, Gläser & Laudel (2010: 199-204) suggest a four-phase procedure: First, based on the theoretical consideration of the research project and research design, a set of rules, e.g. a rule on the unit of analysis, is defined to extract the relevant information from the transcript. Categories help to decide on the relevance of information with regard to the analysis as well as to structure the information. Second, based on the set of rules and categories, the transcript is reviewed, the information is interpreted and relevant pieces of information to be included in the analysis are condensed and – irrespective of the position within the transcript – extracted. Each piece of information of transcript is taken into consideration and checked for relevant information. Third, the extract is prepared for analysis. This includes sorting with regard to subject and time, summarising of scattered, identical information, as well as correction of obvious mistakes. The preceding procedure ensures that the extracted information is aligned towards the research questions. Fourth, the extracted and processed information is analysed with regard to the research questions. The procedure of analysing is not guided by a specifc system; rather, the procedure depends on the extracted information and research questions. For instance, causal mechanisms and effects are identified. Finally, an answer to the research questions is provided (Gläser & Laudel 2010: 260).

3.2.3 Methodological Review

While considerable care has been taken to design the research methods, in some aspects there is room for discussion. This section checks the research methods against some quality criteria and specifies limitations of the diagnostic method that have not been addressed so far or deserve greater attention.

To begin with, it seems reasonable to check whether this research design conforms to the quality criteria of qualitative research methods.

First, whilst the quantitative method provides a prescribed structure and does not provide much room for openness in research, the qualitative method is open for unconsidered, unexpected information and able to place value to the interviewees' perspective. As indicated earlier, even though non-standardised interviews and grounded theory would place greater emphasis on the principle of openness, a partly standardised qualitative interview and qualitative content analysis are expected to strike a balance

between openness and guidance. Because of the systematic combination of quantitative and qualitative methods in a mixed methods design, it is expected that this research design makes sufficient allowance for the principle of openness.

Second, a number of existing sources of data and information on constraints of supply chain performance as well as methods to identify constraints of supply chain performance have been reviewed. Existing approaches in the fields of supply chain management, growth and development economics and market research have been combined and their composition in this research been set out. Hence, it is expected that this research conforms to the principle of a theory-guided procedure. Indications where future research could carry on is outlined at the end of this thesis, in chapter 8.

Third, the relevant considerations and rules that have led to the research design and methodology have been set out. This is expected to provide the necessary information for other researchers to understand the research procedure. Up to now, it is expected that this research conforms to the principle of a rule-guided procedure.

Fourth, differences in background or context may bring respondents to interpret identical situations differently (cf. Hausmann & Klinger & Wagner 2008: 15; Kaufmann & Kraay & Mastruzzi 2010: 10, 18). Respondents may interpret identical attribute levels in the conjoint analysis and identical statements in the Likert-type scale differently. To increase the probability that respondents assign the same meaning to the attribute levels, a standardised attribute structure has been applied throughout the questionnaire in order to establish a common standard and provide explanations.

Fifth, of lower importance but what should be kept in mind is that the results represent only a snapshot at the point of time when the assessment was carried out. Due to changes in context, the importance and performance perception may change over time.

Sixth, it is the aim of the quantitative method to allow for meaningful comparisons of a larger number of responses. This requires that, the variety of information is reduced during the data collection phase but also during the data analysis phase. A prescribed questionnaire structure requires respondents to adapt their information to a certain standard. In the case of differences among characteristics of supply chain domains, this may, however, cause resistance to complete the questionnaire.

4   The Case Selection

To recall, the case selection process of this research searches for countries that are similar on the factors that determine supply chain performance, but differ in their level of supply chain performance. Because countries on the African continent vary considerably from country to country in economic, geographic and demographic characteristics, to name but a few, the geographical scope has been confined to the mainland SADC countries. These include Angola, Botswana, Democratic Republic of the Congo, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe, as illustrated in Figure 4-1 below. Island-states, such as Madagascar, Mauritius and the Seychelles are excluded from this research.

Figure 4-1: Mainland SADC Countries[43]

Source: Based on Map No. 4045 Rev. 7, November 2011, The United Nations

First, this chapter analyses a number of determinants of supply chain performance as well as the level of supply chain performance of the mainland SADC countries. Second, this chapter selects three to four countries as cases for this case study research.

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43   By courtesy of The United Nations

4.1 Economic Development

To get a first impression of the characteristics of mainland SADC countries, this section explores a number of geographic, socio-economic and economic indicators. These include geographic size, population size, population growth, level and growth of GDP per capita as well as the Gini index.

The geographic size, population size and level of GDP per capita figures are depicted in Table 4-1 below. The geographic area of mainland SADC countries ranges from about 17,000 square km in Swaziland to 2.3 million square km in DR Congo. Whilst the mainland SADC countries cover a geographic area of about 9.1 million square km, the European Union (EU) covers a geographic area of about 4.2 million square km. The geographic area of the mainland SADC is more than twice as large as that of the EU. The population ranges from about 1.3 million people in Swaziland to about 79 million in DR Congo. Whilst the mainland SADC countries have a population of about 307 million people, the entire EU has a population of about 511 million people. The population of the mainland SADC is about half that of the EU. The real or constant GPD per capita at purchasing power parity ranges from about 740 international dollars in DR Congo to about 15,700 international dollars in Botswana. Whilst the mainland SADC countries have an average GDP per capita of about 4,000 international dollars, the EU has an average GDP per capita of about 36,000 international dollars. The average GDP per capita of the mainland SADC is only one tenth of that of the EU.

Table 4-1: Land Area, Population and GDP PC PPP

	Land area (sq. km)	Population, total 2016	GDP per capita, PPP (constant 2011 international $) 2016
Angola	1,246,700	28,813,463	5,984.64
Botswana	566,730	2,250,260	15,723.24
Congo, Dem. Rep.	2,267,050	78,736,153	743.89
Lesotho	30,360	2,203,821	2,736.35
Malawi	94,280	18,091,575	1,083.80
Mozambique	786,380	28,829,476	1,128.28
Namibia	823,290	2,479,713	9,852.04
South Africa	1,213,090	55,908,865	12,260.17
Swaziland	17,200	1,343,098	7,723.64
Tanzania	885,800	55,572,201	2,583.28
Zambia	743,390	16,591,390	3,646.96
Zimbabwe	386,850	16,150,362	1,879.63
Mainland SADC	9,061,120	306,970,377	4,167.29
EU	4,238,213	511,497,415	36,329.87

Source: World Bank 2017; Mainland SADC GDP PC calculated based on population and GDP PC per country

Between 1993 and 2016 on average, the population grew at 1.12 percent in Lesotho, 1.50 percent in South Africa, 1.55 percent in Swaziland, 1.67 percent in Zimbabwe, 1.79 percent in Botswana, 1.94 percent in Namibia, 2.30 percent in Malawi, 2.81 percent in Zambia, 2.97 percent in Tanzania, 2.97 percent in Mozambique, 3.08 percent in DR Congo and at 3.31 percent in Angola, as shown in Figure 4-2. Between 1993 and 2016, the population in all mainland SADC countries increased (calculated based on World Bank 2017).

Figure 4-2: Population Growth
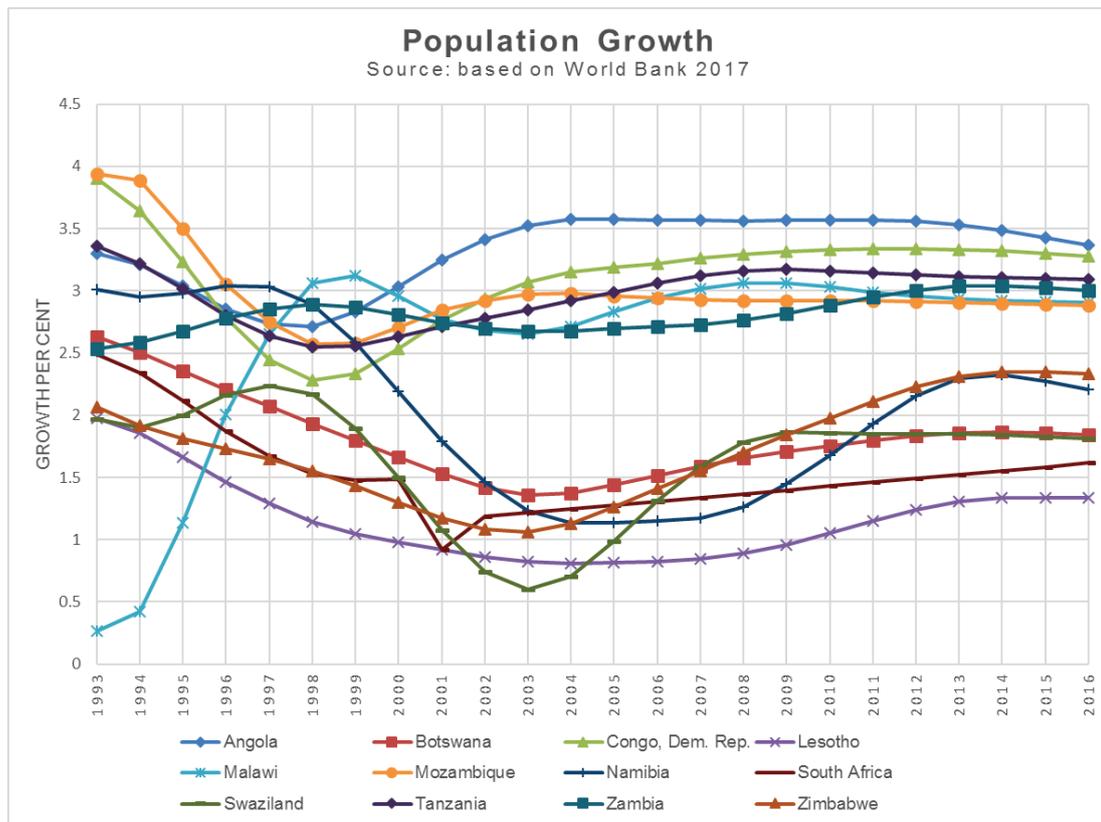
The GDP per capita at PPP and in constant international dollars of 2011 in the mainland SADC can be divided into three main groups, as shown in Figure 4-3 below: [44] First, there is a group of low-income countries such as DR Congo, Malawi, Mozambique, Zimbabwe, Tanzania, Lesotho, and Zambia. Second, there are middle-income countries comprising Swaziland and Namibia as well as, increasingly since 2004, Angola. Third, the relatively high-income countries include South Africa and Botswana.

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44   Note that the classification low, middle and high income here serves to point to differences in the level of GDP PC among the mainland SADC countries and is different from the World Bank country classification by income and GNI (World Bank 2018c).

Figure 4-3: GDP Per Capita
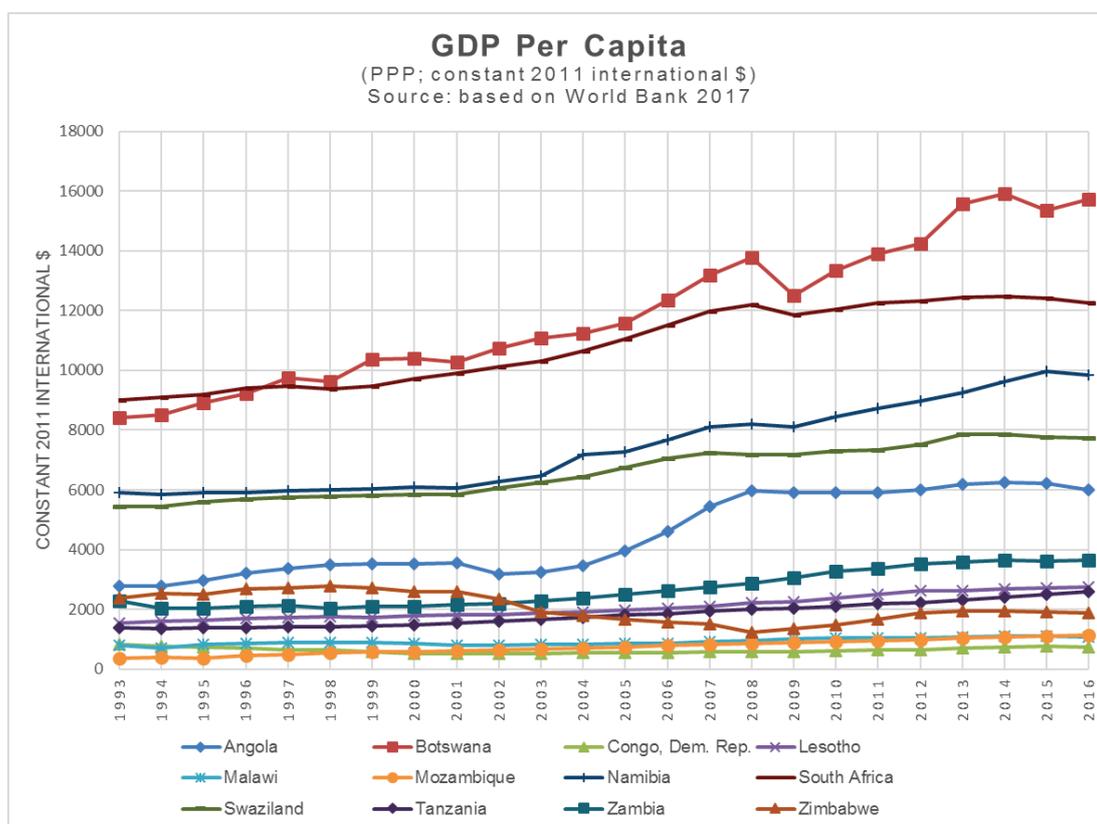
Despite high GDP per capita, or in other words income per capita, in Botswana and South Africa compared to the mainland SADC countries, it should not be ignored that income inequality is high in Botswana and South Africa but in many other mainland SADC coutnries as well, as indicated by the Gini index[45] depicted in Figure 4-4 below.

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45   The Gini index ranges from 0, indicating perfect income equality, to 1, indicating per-fect income inequality. The United Nations Human Settlements Programme provides a general guide of the values and its consequences (UN-HABITAT 2008: 51):

Gini index value	Meaning
0.25 - 0.29	Low inequality; often equal access to public goods and ser-vices, political stability and social cohesion
0.30 - 0.39	Moderate inequality, healthy economic expansion along with political stability and civil social participation
0.40	Alert threshold where social unrest could spark
0.45 - 0.49	Approaching high inequality, often labour markets, public services supply and social progamme deficiencies
0.50 - 0.59	High inequality, often institutional and structural deficiencies
0.60 and above	Very high inequality among individuals and groups; high risk of social unrest or civil conflict

In the mainland SADC, income equality according the the latest available data is high-est in South Africa (value of 63), followed by Namibia (61) and Botswana (61). A Gini index of 60 and above may point to very high levels of income inequality among indi-viduals and groups, to a concentration of material wealth among certain groups at the exclusion of the majority as well as to a high risk of social unrest or conflict. These three countries are followed by Zambia (value of 57), Lesotho (54), Swaziland (52), Malawi (46), Mozambique (46), Zimbabwe (43), Angola (43) and DR Congo (42). A Gini coefficient of 40 and above may point to very high levels of income inequality, to labour market deficiencies, inadequate access to public services, a lack of social pro-grammes and structural deficiencies in income distribution. In addition, a coefficient of 40 and above is regarded as an alert threshold where social unrest could spark. In the mainland SADC, Tanzania had the lowest income inequality (value of 38).

South Africa is one of the countries, which ranks lower than its peer group in the Inclusive Development Indicators of the World Economic Forum. Thus, economic growth in South Africa has not been equally transferred to all parts of the population (WEF 2017: 6; cf. also Nussbaum 2011: 49).

Figure 4-4: Gini Index
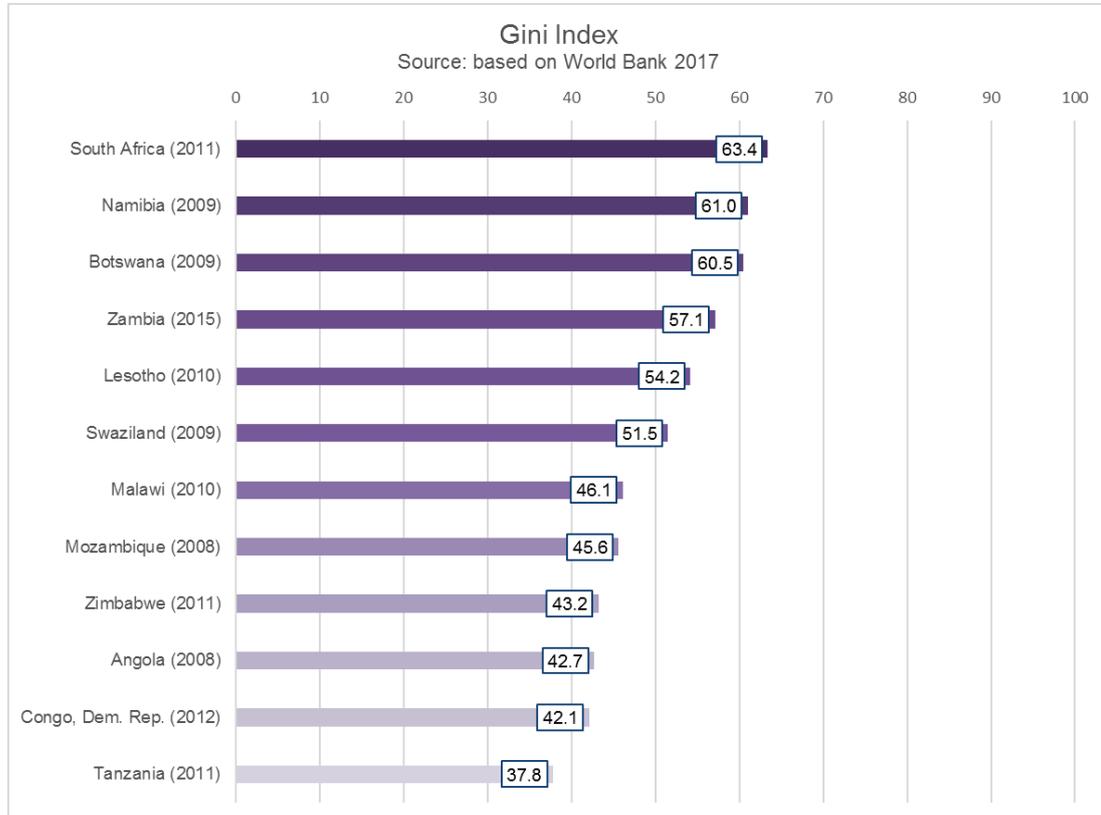
4.2 Logistics Performance

To gain a first impression of the level of logistics performance in mainland SADC countries the Connecting to Compete report with its LPI provides a starting point. The report divides all participating countries based on their international LPI score into five groups or quintiles, ranging from (1) logistics friendly, (2) consistent performers, (3) upper partial performers, (4) lower partial performers to (5) logistics unfriendly. This classification scheme allows for a rough assessment of a country's logistics friendliness or, for the sake of consistency, logistics performance (Arvis et al. 2016: 9-10).

The fifth Connecting to Compete 2016 shows the following situation, as depited in Figure 4-5 below: In the first "logistics friendly" quintile South Africa (Rank 20 of 160 countries) is located. In the second "consistent performers" quintile Botswana (57) and Tanzania (61) are located. In the third "upper partial performers" quintile Namibia (79) and Mozambique (84) are located. In the fourth "lower partial performers" quintile Zambia (114) and DR Congo (127) are located. In the fifth "logistics unfriendly" quintile Angola (139), Zimbabwe (151) and Lesotho (154) are located (Arvis et al. 2016: 38-41).

Figure 4-5: LPI Country Classification 2016
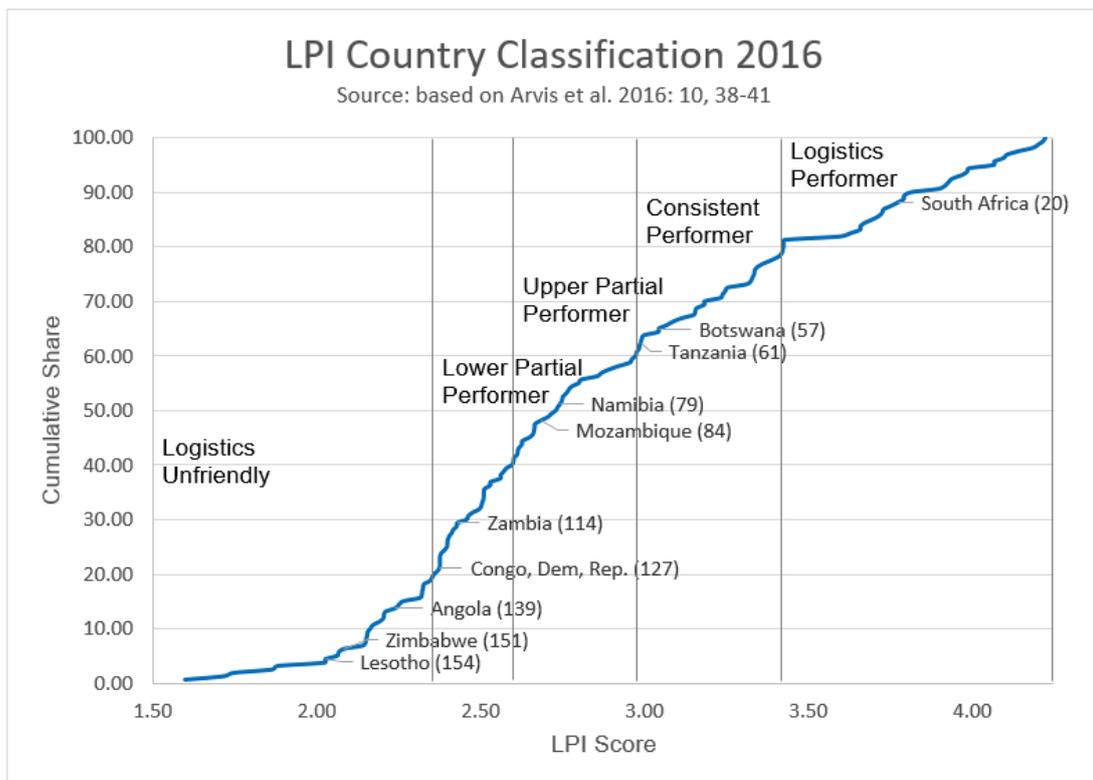
The LPI from 2007 to 2016 show the following overall situation (Arvis et al. 2007; Arvis et al. 2010; Arvis et al. 2012; Arvis et al. 2014; Arvis et al. 2016):

Angola was classified as an upper partial performer in 2007, a logistics unfriendly country in 2010 and 2012, a lower partial performer in 2014, and again a logistics unfriendly country in 2016. Thus, Angola shows a tendency towards being a low performer.

Botswana was classified as a logistics unfriendly country in 2010, an upper partial performer in 2012, a lower partial performer in 2014 and a consistent performer in 2016.[46] Thus, Botswana shows a tendency towards being a partial performer.

DR Congo was classified as an upper partial performer in 2010, and logistics unfriendly country in 2012 and 2014 as well as a lower partial performer in 2016.[47] Thus, DR Congo shows a tendency towards being a lower partial to low performer.

Lesotho was classified as a lower partial performer in 2007 and logistics unfriendly country in 2012, 2014 and 2016.[48] Thus, Lesotho shows a tendency towards being a low performer.

Malawi was classified as a lower partial performer in 2007 and upper partial performer in 2012 and 2014.[49] Thus, Malawi shows a tendency towards being a partial perfomer.

Mozambique was classified as a lower partial performer in 2007, as a logistics unfriendly country in 2010 and 2014 as well as an upper partial performer in 2016.[50] Thus, Mozambique shows a tendency towards being a partial to low performer.

Namibia was classified as a logistics unfriendly country in 2007 and 2010 as well as an upper partial performer in 2012, 2014 and 2016. Thus, Namibia shows a tendency towards being a partial performer.

South Africa was once classified as a consistent performer in 2014 as well as four times as a logistics performer in 2007, 2010, 2012 and 2016. Thus, South Africa shows a tendency towards being a logistics performer.

Swaziland has not been taken into account in any of the five reports.

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46   Botswana was excluded from the sample in 2007.
47   DR Congo was excluded from the sample in 2007.
48   Lesotho was excluded from the sample in 2010.
49   Malawi was excluded from the sample in 2010 and 2016.
50   Mozambique was excluded from the sample in 2012.

Tanzania was classified as a logistics unfriendly country in 2007, lower partial performer in 2010, upper partial performer in 2012, again a logistics unfriendly country in 2014 and a consistent performer in 2016. Thus, Tanzania shows a tendency towards being a partial performer.

Zambia was classified as a lower partial performer in 2007, logistics unfriendly country in 2010, and again a lower partial performer in 2014 and 2016.[51] Thus, Zambia shows a tendency towards being a lower partial to low performer.

Zimbabwe was classified as a lower partial performer in 2007 and 2012 as well as a logistics unfriendly country in 2014 and 2016.[52] Thus, Zimbabwe shows a tendency towards being a lower partial to low performer.

The LPI 2007 to 2016 suggest that South Africa is a logistics performer, Botswana, Malawi, Namibia, Tanzania partial logistics performers, DR Congo, Mozambique and Zambia partial to low performers as well as Angola, Lesotho and Zimbabwe low performers.

4.3 Manufacturing and Export Performance

To gain an impression of the level of manufacturing performance in mainland SADC countries their export structure[53] and economic complexity (according to the Atlas of Economic Complexity) may provide insight (CID at Harvard University 2017):

In 2016, Angola exported goods of 26.8 billion USD. Fuels, lubricants and related materials accounted for 91.8 percent (e.g. crude petroleum, oil and gas), manufactured goods (e.g. diamonds) for 6.9 percent. Thus, in 2016 the export structure of Angola was highly concentrated on fuel, lubricants and related materials. Angola ranks at 103 of 122 countries in the economic complexity index.[54] It is important to note here that in 1974, the export structure of Angola was much more diversified.

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51   Zambia was exluded from the sample in 2012.

52   Zimbabwe was excluded from the sample in 2010.

53   Whilst the export data of the Atlas of Economic Complexity according to the Harmonized System (HS) goes back to the year 1995, the data according to the Standard International Trade Classification (SITC) dates back to 1962. For the sake of comparability of data over a longer period, the export data according to the SITC (at the one and four digit level) is used.

54   To recall, crude pretroleum and oils but also diamonds are located at the periphery of the product space, implying few linkages to other products and, thus, few opportunities for diversification.

Fuels, lubricants and related materials accounted for 43.5 percent, food and live animals for food (e.g. coffee, bananas, fish) for 26.1 percent, crude materials (e.g. sisal, cotton, copper) for 15.8 percent and manufactured goods for 12.1 percent. It should only be mentioned in passing that in 2014, Angola exported goods of 62.5 billion USD. Although the monetary value was much higher in 2014, the structure was similar.

Botswana exported goods of 7.8 billion USD. Manufactured goods (e.g. diamonds) accounted for 90.8 percent, crude materials (nickel ores) for 3.8 percent, machinery and transport (electric wire) for 2.4 percent, food and live animals (bovine meat) for food for 1.3 percent. Botswana ranks at 66 of 122 countries in the Economic Complexity Index.

DR Congo exported goods of 4.5 billion USD. Manufactured goods (e.g. copper, base materials, diamonds) accounted for 78.9 percent, crude materials (e.g. ores and concentrates) for 10.4 percent, fuels, lubcricants and related materials (e.g. crude petroleum and oil) for 6.2 percent and other for 2.4 percent. Data on the Economic Complexity Index of DR Congo is not available.

Lesotho exported goods of 0.89 billion USD. Other manufactured articles (e.g. outerwear, under-garments, footwear) accounted for 50.8 percent, manufactured goods (e.g. diamonds) for 34.6 percent, machinery and transport (e.g. switches, relays, fuses) for 7.0 percent, crude materials (e.g. wool) for 4.4 percent and food and live animals for food (flour) for 3.1 percent. Data on the Economic Complexity Index of Lesotho is not available.

Malawi exported goods of 0.92 billion USD. Tobacco and drinks (e.g. tobacco) accounted for 58.0 percent, food and live animals for foods (e.g. tea, sugar, beans) for 27.5 percent, other (non-monetary gold) for 8.7 percent, crude materials (e.g. nuts) for 3.0 percent and manufactured goods (e.g. wood, leather) for 1.1 percent. Malawi ranks at 114 of 122 countries in the Economic Complexity Index.

Mozambique exported goods of 3.97 billion USD. Fuel, lubricants and related materials (e.g. coal, electric current, gas) accounted for 32.8 percent, manufactured goods (e.g. aluminium, precious stones) for 27.4 percent, crude materials (e.g. sawlogs, ores) for 15.7 percent, food and live animals for food (e.g. beans, nuts) for 11.7 percent, drinks and tobacco (e.g. tobacco) for 6.8 percent and other (non-monetary gold) for 2.8 percent. Mozambique ranks at 115 of 122 in the Economic Complexity Index.

Namibia exported goods of 5.23 billion USD. Manufactured goods (e.g. diamonds, copper, zinc) accounted for 44.9 percent, food and live animals for food (e.g. fish, grapes, bovine meat) for 17.2 percent, crude materials (copper, salt, wood) for 16.2 percent, machinery and transport (e.g. vessels) for 8.3 percent, other (e.g. non-monetary gold) for 6.7 percent, chemicals and related products (e.g. radioactive chemical elements) for 3.6 percent as well as drinks and tobacco (e.g. beer) for 1.7 percent. Namibia ranks at 74 of 122 countries in the Economic Complexity Index.

In 2016, South Africa exported goods of 105 billion USD. Manufactured goods (e.g. metals of platinum, diamonds, ferro-alloys) accounted for 24.3 percent, other (e.g. non-monetary gold) for 22.6 percent, machinery and transport (passenger motor vehicles, motor vehicles for transport of goods) for 16.8 percent, crude materials (e.g. iron ore, manganese ore) for 12.5 percent, food and live animals for food (e.g. oranges, grapes) for 7.2 percent, fuels, lubricants and related materials (e.g. coal) for 7.1 percent, chemicals (e.g. medicines) for 5.4 percent, other (e.g. footwear) manufactured articles for 2.4 percent and drinks and tobacco (e.g. wine) for 1.3 pecent. South Africa ranks at 49 of 122 countries in the Economic Complexity Index.

Swaziland exported goods of 1.57 billion USD. Chemicals and related products (e.g. mixtures of odoriferous) accounted for 44.2 percent, food and live animals for food (e.g. sugar) for 27.5 percent, other manufactured articles (e.g. textile fabrics) for 12.3 percent, crude materials (e.g. wood) for 5.5 pecent, machinery and transport (e.g. swichtes) for 3.9 percent, manufactured goods (e.g. bags) for 3.8 percent, fuels, lubricants and related materials (e.g. petroleum gases) for 1.6 percent as well as other (e.g. non-monetary gold) for 1.1 percent. Data on the Economic Complexity Index of Swaziland is not available.

Tanzania exported goods of 6.12 billion USD. Other (e.g. non-monetary gold) accounted for 37.5 percent, food and live animals for food (e.g. vegetables and fruit, coffee, fish) accounted for 22.9 percent, crude materials (e.g. ores) for 13.0 percent, manufactured goods (e.g. bottles, diamonds) for 12.6 percent, drinks and tobacco (e.g. tobacco) for 7.1 percent, other manufactured goods (e.g. textiles) for 2.7 percent, chemicals and related products (e.g. fertilisers) for 1.8 percent and machinery and transport for 1.1 percent. Tanzania ranks at 97 of 122 countries on the Economic Complexity Index.

Zambia exported goods of 5.45 billion USD. Manufactured goods (e.g. copper) accounted for 86.2 percent, food and live animals for food (e.g. maize) for 4.3 percent,

crude materials (e.g. sawlogs) for 4.2 percent, drinks and tobacco (e.g. tobacco) for 3.4 precent, machinery and transport (e.g. electric wires) for 1.0 precent. Zambia ranked at 95 of 122 countries in the Economic Complexity Index.

Zimbabwe exported goods of 1.97 billion USD. Drinks and tobacco (e.g. tobacco) account for 46.0 percent, crude materials (e.g. nickel ores) for 25.1 percent, manufactured goods (e.g. diamonds) for 15.7 percent, food and live animals for food (e.g. sugar) for 7.9 percent, other (non-monetary gold) for 2.6 percent. Zimbabwe ranked at 94 of 122 countries in the Economic Complexity Index.

First, what is striking is that most mainland SADC countries heaviliy rely on the export of mineral resources. In 2010, countries with natural resource exports higher than ten percent included Angola, Mozambique, Namibia, Botswana, South Africa[55], Zambia, Zimbabwe. Since many countries in mainland southern Africa heavily rely on the export of minerals, instead of economic complexity, mineral resource export intensity may explain their variation in GDP per capita better. Especially the economic wealth, i.e. output, in Angola was much higher than the Economic Complecity Index suggested (cf. Hausmann et al. 2013: 27-28). This could be interpreted in such a way that a high economic performance may not necessarily go in line with a high supply chain performance.

Second, the Economic Complexity Index indicates that South Africa has the highest product complexity of the mainland SADC countries (rank 49), followed by Botswana (66) and Namibia (74). Zimbabwe (94), Zambia (95), Tanzania (97), Angola (103), Malawi (114) and Mozambique (115) have a low product complexity.

The UNIDO and UNCTAD (2011: 43-44) classified and analysed industrial production (including natural resource production) in countries on the African continent. Based on the industrialisation level, represented by manufacturing value added (MVA) per capita, and industrial growth performance between 1990 and 2010, represented by annual growth rate of manufacturing value added per capita, five categories of industrial performance were composed. (1) Forerunners – high industrialisation level and

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55   Hausmann & Klinger (2008) analysed the goods export sophistication of South Africa and found that the country's exports are generally located at the periphery of the product space. The country is still heavily engaged in mining and natural resource export – an area with few linkages to other products. They conclude that the unsufficent structural transformation explains the insufficient growth in exports and GDP per capita.

high industrial growth performance; (2) Achievers – high level and low growth performance; (3) Catching-up – medium level and high growth performance; (4) Falling behind – medium level and low growth performance; (5) Infant stage – low level and low industrial growth performance.[56]

The only forerunner in the mainland SADC is Namibia. Despite its high industrialisation level and strong industrial growth performance, the country still heavily relies on resource-based manufacturing and, according to the Rosendahl (2010: 39; UNIDO & UNCTAD 2011: 46) needs to further intensify its activities in medium and high technology manufacturing.

The achievers in the SADC are South Africa and Swaziland. Albeit at a much higher industrialisation level than Namibia, their industrial growth performance was low.

The countries that are catching-up in the mainland SADC are Angola, Mozambique and Lesotho. They have a small manufacturing sector, but their industrial growth performance is high. Especially Angola and Mozambique recorded growth rates between 2001 and 2010.

The countries falling behind include Botswana, Zimbabwe, Zambia and Tanzania. Although Botswana's industrialisation level is close to the threshold of becoming an achiever, it only had a medium industrial growth performance. Tanzania only has a low industrialisation level and industrial growth performance; however, growth rates in the second half of that period accelerated significantly. Zimbabwe is characterised by a low industrialisation or even de-industrialisation and low industrial growth performance figures.

The infant stage comprises DR Congo and Malawi (UNIDO & UNCTAD 2011: 45-53).[57]

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56   Once the use of this framework goes beyond the identifictation of the stage of development and towards industrial strategy definition, the authors of the report state that it is necessary to delve into the structure of the manufacturing value added figures and to identify the most severe constraints of improvements in manufacturing performance of a country (UNIDO & UNCTAD 2011: 57-58). In this research, the use of this framework is limited to the identification of the stage of manufacturing in selected countries.

57   The latest MVA per capita (constant 2010 USD) and annual growth data using annual averages from 2008 to 2016 (source based on World Bank 2017) suggests that a number of countries moved from the infant and falling behind to the catching up stage. The group of forerunners and achievers remains largely stable.

4.4 Selection of Central and Peripheral Cases

The previous sections have limited the scope of the case selection process to main-land SADC countries and explored a number of economic, geographic, socio-eco-nomic as well as supply chain performance indicators. Based on this analysis, this section further limits the scope of this research to three to four countries. These coun-tries are supposed to be most similar on a number of characteristics that co-determine their level of supply chain performance, but differ in their level of supply chain perfor-mance. Although similarity is ideally measured and confirmed by control variables, it is often sufficient to assume similarity if some factors are similar (Gerring 2007: 133).

While comparing the numbers, Angola, Mozambique, Namibia and South Africa caught the eye. The level of economic development in the wide population in those countries is relatively low. In particular, in South Africa and Namibia but also in Angola and Mozambique, the income distribution is very unequal among the population. In addition, against the background of growing populations in all four countries, there is a need for more job opportunities. As carved out in chapter two on the link between supply chain performance and economic growth and development, improvements in supply chain performance can contribute to employment opportunities and income through various mechanisms, such as exchange of goods, exchange of knowledge, local value-add and integration into value networks as well as external economies and economic agglomeration. Nonetheless, it is worth stressing again at this point that it also rests upon the set and design of institutions of a country and region as to whether economic growth adequately translates into economic development.

Then, as required by the most-similar approach, these countries are similar on a num-ber of factors that determine their supply chain performance, but differ on their level of supply chain performance. First, Angola, Mozambique, Namibia and South Africa are coastal countries on the southern African continent. All four countries have direct access to maritime transport networks. Second, all countries cover a large geographic area and, at the same time, are sparsely populated outside of economic centres. In-teresting to note here is that Arvis et al. (2016: 11) consider geography and direct coastal access to be major determinants of logistics performance. Similarly, the Afri-can Development Bank (AfDB 2010: 8-9) states that distance and coastal access or landlockedness, i.e. geographic characteristics, are major determinants of trade. Moreover, the African Development Bank (2010: 109) considers low population den-

sity as a major reason for low density of port hinterland links and industrial development. Third, in all four countries, mineral resource production and export makes up a high share of their economic production. Fourth, despite different economic development paths, Angola, Mozambique, Namibia and South Africa have a colonial history; all four were colonies of European countries. Angola and Mozambique became independent from Portugal in 1975 (Kuder 1994: 183). In Namibia, in 1884 people from Germany settled down and colonialised the country. After the First World War, in 1919, the League of Nations assigned Namibia as a mandated territory to South Africa. In 1990, Namibia eventually became independent from South Africa. It was only in 1994 when Walvis Bay, Namibia's major seaport location was handed over to Namibia. In South Africa, from 1652 on, people mainly from the Netherlands and Great Britain but also from France and Germany settled down. In 1910, South Africa became independent from Great Britain and in 1994 introduced the majority rule (CIA 2017). A further common characteristic is the membership of the Southern African Development Community with its shared commitment to pursue common objectives with regard to transport, trade and spatial development (SADC 2018a; 2018b). In addition, year-round navigable inland waterways are rare in southern Africa. Transport on inland waterways is generally of low importance to supply chains in southern Africa. The few inland waterways are provided by the rivers Congo, Zambezi and Shire as well as by the lakes Victoria, Tanganyika and Malawi (AfDB 2010: 117-118).

While there are a number of common characteristics between Angola, Mozambique, Namibia and South Africa, these four countries differ in their level of supply chain performance. As the preceding sections revealed, Angola and Mozambique show a low, Namibia a medium, and South Africa a high supply chain performance.[58]

For these reasons, Angola, Mozambique, Namibia and South Africa are going to represent the central units of analysis of this research. Since neighbouring countries contribute and justify supply chain volumes in the four countries of analysis, neighbouring countries are considered as peripheral cases, where of value. To ensure that local partners are involved in this research and to obtain local guidance, there was a need to find a university or research organisation in each country. In Angola, the Centro de Estudos e Investigação Científica da Universidade Católica de Angola, in Namibia the

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58   This presumption of similarity in a number of major characteristics that co-determine
      supply chain performance and dissimilarity in supply chain performance goes in line
      with the statements of interviewees (cf. statement number SA-04-01, SA-36-01).

German-Namibian Centre for Logistics at the Namibia University of Science and Technology and in South Africa the Department of Transport and Supply Chain Management at the University of Johannesburg came on board. In Mozambique, despite contacting a multitude of organisations and recommended partners from South Africa, it turned out that a local partner organisation could not be found. For this reason, it was decided to limit the research design to three countries. Since the research design still considers countries at three different levels of supply chain performance, the removal of Mozambique from the design is not expected to have any disadvantages.

5   The State of Supply Chain Performance of Selected Countries

Based on the case selection, this chapter, chapter five, explores a number of additional country characteristics and then moves on to review and continue to review, respectively, the data of the selected cross-country benchmarks on the state of supply chain performance of Angola, Namibia and South Africa. By doing so, this chapter provides an answer to the research question on what is the current state of supply chain performance in selected countries. This analysis is expected to provide points of entry and reference for the identification of constraints of supply chain performance.

5.1   Country Characteristics and Situation

As a start, to get a better understanding of the three selected countries, this section continues to explore country characteristics that affect supply chain performance.

5.1.1   Angola

The Republic of Angola[59] is located on the South Atlantic Ocean, on the west coast of southern Africa, as depicted in the map, in Figure 5-1 below.

The country has a total length of borders of 5,369 kilometres, of which 2,646 km is to DR Congo, 1,427 km to Namibia, 1,065 km to Zambia and 231 km to the Republic of the Congo. The length of the coastline is 1,600 km. The country has a geographical scope of 1,246,700 square kilometres.

The country has 18 regions, i.e. administrative divisions, namely Bengo, Benguela, Bie, Cabinda (exclave), Cunene, Huambo, Huila, Kwando, Kubango, Kwanza Norte, Kwanza Sul, Luanda, Lunda Norte, Lunda Sul, Malanje, Moxico, Namibe, Uige and Zaire. Angola's capital is Luanda. The major economic centres are the capital Luanda with a population of 5.506 million and Huambo with a population of 1.269 million.

The country has a semiarid climate in the south and at the coast; it has a cool and dry season from May to October and a hot and rainy season from November to April in the north. The country has a narrow coastal strip, which turns into the interior plateau.

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59   Conventional long form

Angola has an estimated population of 29,310,273 million in 2017. The population density is 24 people per square kilometre of land area. The median age of the population is 15.9 years. The growth rate of the population was estimated at 3.52 per cent in 2017. Portuguese is the official language. Angola has at least 11 recognised national languages.

In 1975, Angola had a well-functioning transport system. Since its independence in 1975 from Portugal, Angola experienced a prolonged period of civil war until 2002. The war destroyed the country's transport system. The ongoing infrastructure destruction and operational disruptions not only affected Angola's economy; neighbouring countries DR Congo and Zambia also had to establish alternative, more distant, transport routes. The long-lasting war set the country's stage of economic development back and rendered sustainable reconstruction and new investment impossible[60]. With the end of the civil war, the country turned into a period of reconstruction, upgrading and extension, facilitated by the increase in the oil price and associated increase in public and private revenues (Duarte et al. 2015: 1-2). After the war, between 2002 and 2008, Angola was one of the countries with the highest real GDP growth rates worldwide (Rocha 2012: 1, 2). The country is still in is reconstruction phase.

The export structure, the GDP per capita, the population growth and the income distribution of Angola have already been analysed in the previous chapter, as part of the case selection process, and will therefore not be dwelt on longer here.

The main seaports are Cabinda, Lobito, Luanda and Namibe and, for liquefied natural gas exports, Soyo. The road network encompasses 51,429 km, of which 5,349 km is paved and 46,080 km is unpaved (2001). The rail network encompasses 2,852 km, of which 2,729 km is 1.067-m and 123 km is 0.600-m gauge size. The waterways encompass 1,300 km.

The country's currency, the Kwanza (AOA), depreciated against the US-Dollar (USD) over the last years, from 95.47 (in 2012 est.), 98.30 (2013 est.), 120.06 (2014 est.), 120.06 (2015 est.) to 172.00 (2016 est.) (unless otherwise specified CIA 2017).

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60   For instance, to name just two examples, the war broke out at a time when the container was introduced and established as the major logistics unit in maritime and port hinterland transport (AfDB 2010: 67). Gwilliam (2011: 88) states that during the war, the rail infrastructure was destroyed and there was first a need to remove the land mines before any reconstruction of the rail transport infrastructure could start.

Figure 5-1: Map of Angola[61]

Source: Angola, Map No. 3727 Rev.4, August 2008, The United Nations

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61   By courtesy of The United Nations

5.1.2 Namibia

The Republic of Namibia[62] is located on the South Atlantic Ocean, on the west coast of southern Africa, as depicted in the map, in Figure 5-2 below.

The country has a total length of borders of 4,220 kilometres, of which 1,544 km is to Botswana, 1,427 km to Angola, 1,005 km to South Africa and 244 km to Zambia. The length of the coastline is 1,572 km. The country has a geographical scope of 824,292 square kilometres.

The country has 14 regions, i.e. administrative divisions, namely, Erongo, Hardap, //Karas, Kavango East, Kavango West, Khomas, Kunene, Ohangwena, Omaheke, Omusati, Oshana, Oshikoto, Otjozondjupa and Zambezi. The major economic centre is the capital Windhoek with a population of 368,000 people.

The country has a desert climate, it is hot and dry, and the rainfall is sparse and erratic. The country is subject to prolonged periods of drought. Whilst the Namib Desert covers the coastal strip, the Kalahari Desert / savanna covers the interior high plateau and the east of the country.

Namibia has a population of 2,484,780 million (2017). The population density is three people per square kilometre of land area. The median age of the population is 21.2 years. The growth rate of the population was estimated at 1.95 per cent in 2017. English is the official language. Namibia has 13 recognised national languages.

As outlined in the previous chapter, from 1884 until the end of the First World War Namibia was a German colony, German South-West Africa. After the First World War, South Africa took South West Africa over, administered Namibia as a mandate and annexed its territory after the Second World War. South West-Africa became independent from South Africa in 1990, Walvis Bay in 1994.

The export structure, the GDP per capita, the population growth and the income distribution of Namibia have already been analysed in the previous chapter, as part of the case selection process, and will therefore not be dwelt on longer here.

The main seaports are Walvis Bay and Lüderitz. The road network encompasses 44,138 km, of which 6,387 km is paved and 37,751 km is unpaved. The rail network encompasses 2,628 km, of which 2,628 km is 1.067-m gauge size.

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62   Conventional long form

The country's currency, the Namibian Dollar (NAD), depreciated against the USD during the last years, from 8.2000 (2012 est.), 10.8526 (2013 est.), 12.7589 (2014 est.), 14.7096 (2015 est.) to 14.7096 (2016 est.). The NAD is linked to South Africa's currency, the South African Rand (unless otherwise specified CIA 2017).

Figure 5-2: Map of Namibia[63]
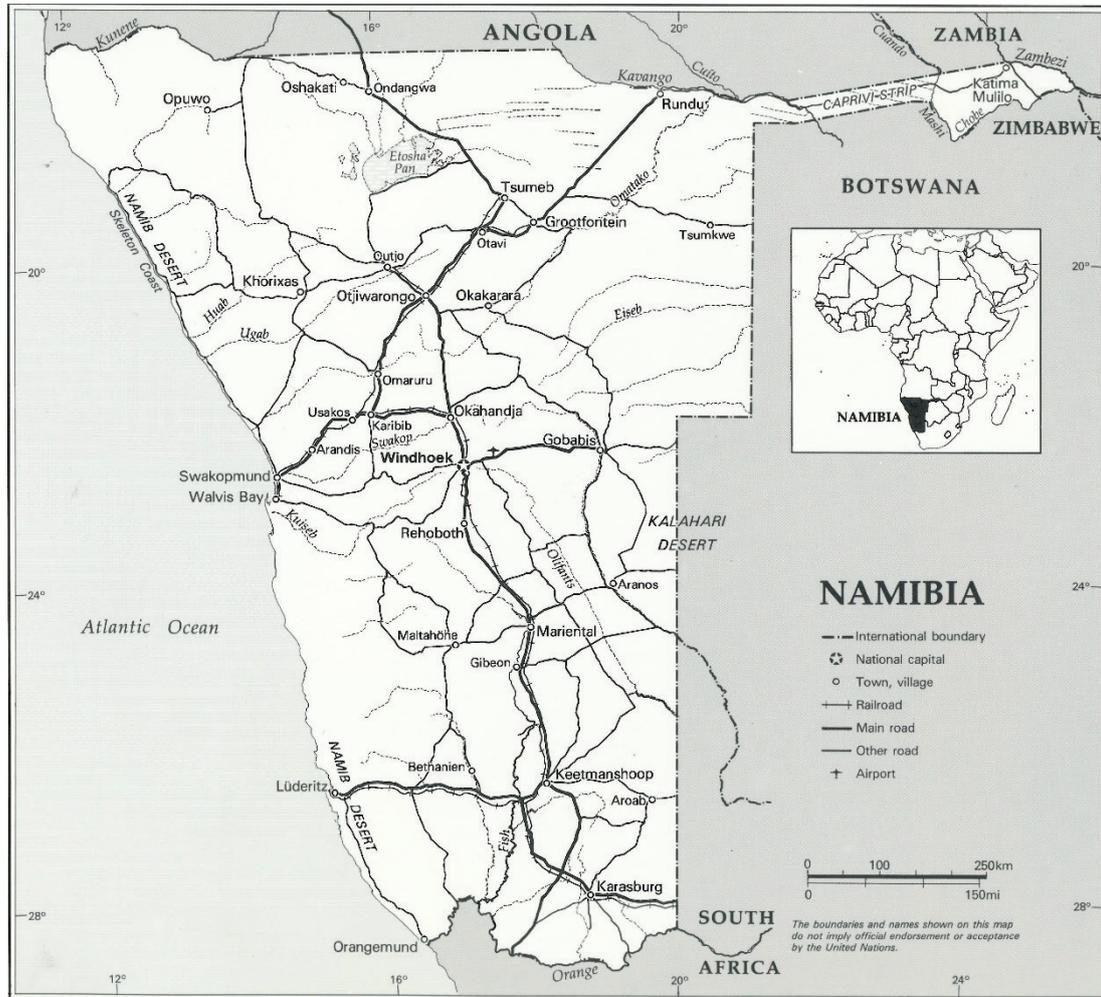
Source: Namibia, Map No. 3381, June 1986, The United Nations

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63   By courtesy of The United Nations

     Although this map was last updated in 1986, it still seems to reflect the major country characteristics, which are relevant to this research, correctly. Worthy to note is that the former administrative division Caprivi has been renamed into Zambezi.

5.1.3 South Africa

The Republic of South Africa[64] is located on the southern tip of the African continent, on the South Atlantic and Indian Ocean, as depicted in the map, in Figure 5-3 below.

The country has a total length of borders of 5,244 kilometers, of which 1,969 km is to Botswana, 1,106 km to Lesotho, 1,005 km to Namibia, 496 km to Mozambique, 438 km to Swaziland and 230 km to Zimbabwe. The length of the coastline is 2,798 km. The country has a geographical scope of 1,219,090 square kilometres.

The country has nine regions, i.e. administrative centres, namely Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West and Western Cape. South Africa's administrative capital is Pretoria, its legislative capital is Cape Town and its judicial capital is Bloemfontein. The main economic centres are Johannesburg including Ekurhuleni with 9.4 million, Cape Town 3.7 million, Durban 2.9 million, Pretoria 2.1 million, Port Elizabeth 1.2 million and Vereeniging 1.2 million inhabitants (2015).

The country has a mostly semiarid climate; it is subtropical along the east coast. The country has a narrow coastal plain and hills border its interior plateau.

South Africa has a population of 54.8 million (2017 estimated). The population density is 45 people per square kilometre of land area. The median age of the population is 27.1 years. The growth rate of the population was estimated at 0.99 per cent in 2017. South Africa has 11 official languages, IsiZulu, IsiXhosa, Afrikaans and English to name but a few.

During the apartheid period, the country became internationally isolated what in turn led to the development of autarky and need for self-sufficiency (BME & Bogaschewsky 2004: 26). The export structure, the GDP per capita, the population growth and the income distribution of South Africa have already been analysed in the previous chapter, as part of the case selection process, and will therefore not be dwelt on longer here.

The main seaports are Cape Town, Durban, Port Elizabeth, Richards Bay and Saldanha Bay as well as for liquefied natural gas imports Mossel Bay. The road network encompasses 747,014 km, of which 158,952 km is paved and 588,062 km is unpaved. The rail network encompasses 20,986 km, of which 80 km is 1.435-m gauge size

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64   Conventional long form

electrified, 11,485 km is 1.065-m gauge size unelectrified, 8,271 km is 1.065-m gauge size electrified and 1,150 km is unspecified gauge size.

The country's currency, the South African Rand (ZAR), depreciated against the USD over the last years, from 8.2000 (2012 est.), 10.8469 (2013 est.), 12.7581 (2014 est.), to 14.6924 (2015 est. and 2016 est.) (unless otherwise specified: CIA 2017).

Figure 5-3: Map of South Africa[65]

Source: South Africa, Map No. 3768 Rev.6, February 2007, The United Nations

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65   By courtesy of The United Nations

5.2 Cross-Country Benchmark Evidence

To get a better understanding of the level of supply chain performance and to obtain first indications of potential constrains of supply chain performance in Angola, Namibia and South Africa, this section continues to explore cross-country benchmarks.

5.2.1 Connecting to Compete

To gain a deeper insight into the logistics performance of the three selected countries, this section explores the latest data, from 2016, on the international LPI and its six components. To recall, the six components include the customs, infrastructure, international shipments, logistics quality and competence, tracking and tracing as well as the timeliness component, as depicted in Figure 5-4 below (Arvis et al. 2016: 38-41).

In 2016, overall, South Africa received the highest score. At a distance, South Africa is followed by Namibia. On all components, South Africa sets itself apart from Namibia and especially Angola. Angola received the lowest score on all components.

In Angola, customs received the lowest score (1.80), followed by infrastructure (2.13), tracking and tracing (2.21), logistics quality and competence (2.31), international shipments (2.37) as well as timeliness (2.59). Thus, the efficiency of customs and border management clearance provides the lowest performance in Angola.

In Namibia, tracking and tracing received the lowest score (2.52), followed by logistics quality and competence (2.63), customs (2.65), international shipments (2.69), infrastructure (2.76) as well as timeliness (3.19). Thus, the ability to track and trace consignments provides the lowest performance in Namibia.

In South Africa, customs received the lowest score (3.60), followed by international shipments (3.62), logistics quality and competence (3.75), infrastructure (3.78), tracking and tracing (3.92) as well as timeliness (4.02). Thus, the efficiency of customs and border management clearance provides the lowest performance in South Africa.

Figure 5-4: International LPI Components
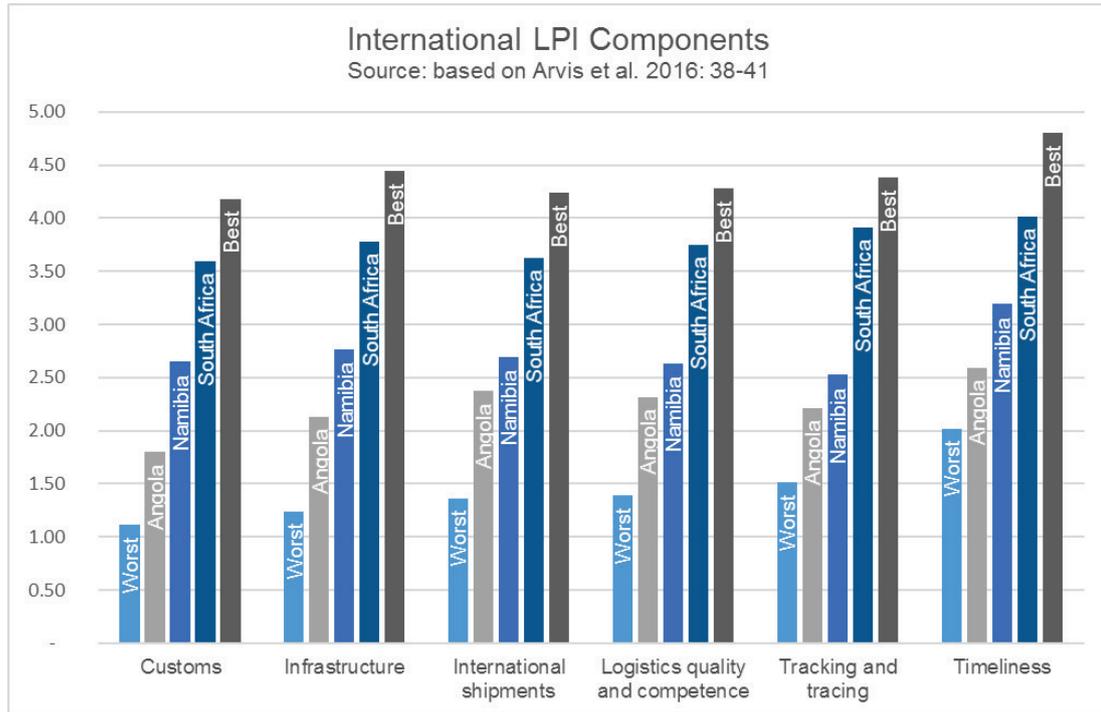
Arvis et al. (2016: 9) remark that border agency and infrastructrure performance received the lowest scores across all quintiles, but particularly in low performing countries. This goes in line with customs and infrastructure performance in Angola and customs performance in South Africa. Arvis et al. (2016: 12, 20) continue by stating that improving border clearance procedures and improving physical infrastructure will remain major areas for improvement in low-income countries. Physical inspection and inspections by multiple agencies are generally higher in low performing countries. Arvis et al. (2016: 17-18) also found that infrastructure still represents a constraint in many developing countries, although there are improvements. In particular, rail transport infrastructure received low scores across all quintiles and regions. Similarly, rail transport services, as part of the quality and competence of logistics service providers component, consistently received low scores across all quintiles and regions.

To get even more detailed information on the logistics performance of the countries under analysis, in addition to the international LPI, the domestic LPI could be used. However, both the environmental and institutional as well as the performance part of the domestic LPI have numerous discrepancies. For this reason and despite the high potential information content of the desired data, the environmental and institutional as well as the performance part of the domestic LPI are not taken into account here.

5.2.2 Doing Business

To gain a deeper insight into the regulatory performance of the three selected countries, this section explores the latest data on Doing Business and its 10 indicators. To recall, these include starting a business, dealing with construction permits, getting electricity, registering property and getting credit, protecting minority investors, paying taxes, trading across borders, enforcing contracts as well as resolving insolvency indicator, as depicted in Figure 5-4 and Figure 5-5 below (World Bank 2018a: 143, 181, 193).

In 2017, overall, South Africa ranked 82 with a distance to frontier score of 64.89 percent, Namibia ranked 106 with a distance to frontier score of 59.94 and Angola ranked 175 with a distance to frontier score of 41.49.

The distance to frontier scores for starting a business, dealing with construction permits, getting electricity, registering property and getting credit indicator are depicted in Figure 5-5 below.

The starting a business indicator for Angola stands at 80.09, for Namibia at 68.90 and for South Africa at 79.97.
The dealing with construction permits indicator for Angola stands at 68.80, for Namibia at 66.10 and for South Africa at 67.53.
The getting electricity indicator for Angola stands at 44.08, for Namibia at 78.12 and for South Africa at 63.21.
The registering property indicator for Angola stands at 40.86, for Namibia at 38.35 and for South Africa at 58.43.
The getting credit indicator for Angola stands at 5.00, for Namibia at 60.00 and for South Africa at 60.00.

The distance to frontier scores for protecting minority investors, paying taxes, trading across borders, enforcing contracts as well as resolving insolvency indicator are depicted in Figure 5-6 below.

The protecting minority investors indicator for Angola stands at 55.00, for Namibia at 53.33 and for South Africa at 70.00.
The paying taxes indicator for Angola stands at 69.54, for Namibia at 74.52 and for South Africa at 80.02.
The trading across borders indicator for Angola stands at 25.28, for Namibia at 61.47 and for South Africa at 58.01.

The enforcing contracts indicator for Angola stands at 26.26, for Namibia at 61.58 and for South Africa at 54.10.

The resolving insolvency for Angola stands at 0.00, for Namibia at 37.04 and for South Africa at 57.59.

Figure 5-5: Doing Business I/II
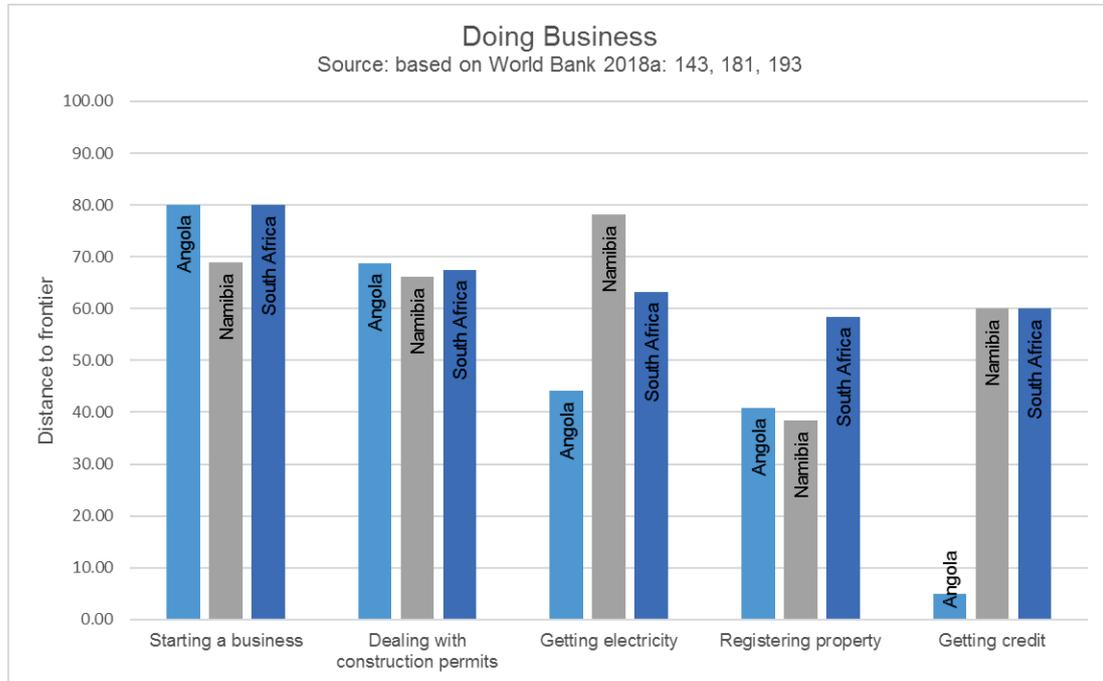
Figure 5-6: Doing Business II/II
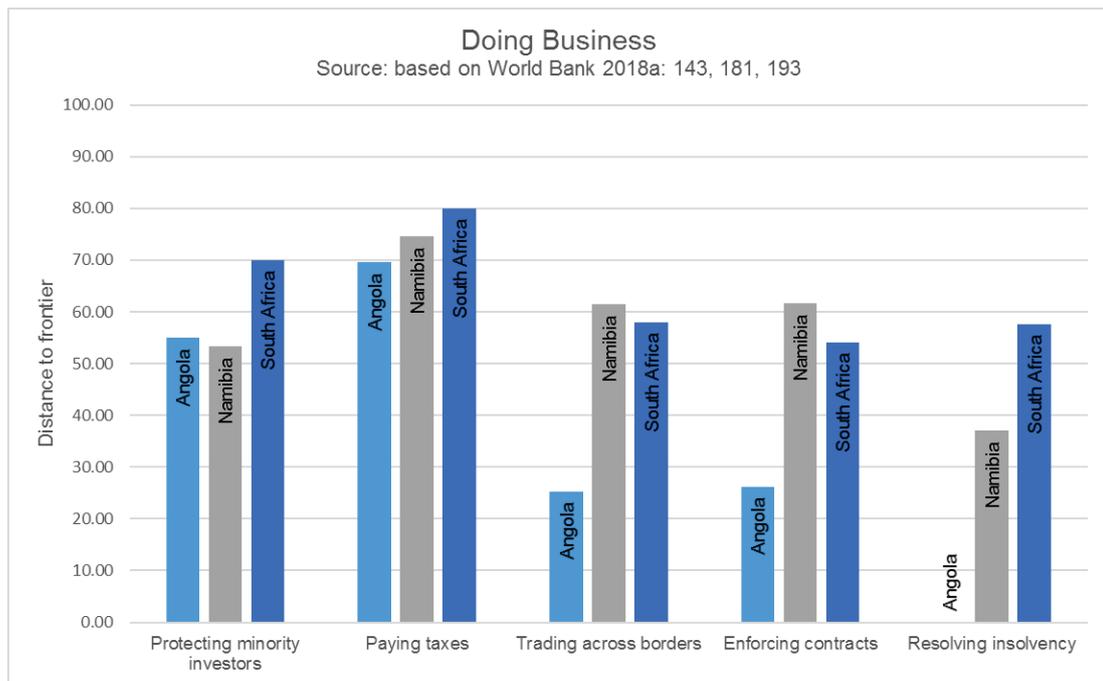
Overall, the ease of doing business is very different in Angola, Namibia and South Africa. The ease of doing business is lowest in Angola, inbetween in Namibia and highest in South Africa. Within-country variance across indicators is high as well.

In Angola, resolving insolvency (0.00), getting credit (5.00)[66], trading across borders (25.28), enforcing contracts (26.26) and registering property (40.86) provide the lowest performance.

In Namibia, resolving insolvency (37.04), registering property (38.35), protecting minority investors (53.33), getting credit (60.0) and trading across borders (61.47) provide the lowest performance.

In South Africa, enforcing contracts (54.00), resolving insolvency (57.59), trading across borders (58.01), registering property (58.43) and getting credit (60.0) provide the lowest performance.

5.2.3 Global Competitiveness Report

To gain a deeper insight into the competitive performance of the three selected countries, this section explores the latest data on the Global Competitiveness Index and its 12 pillars. To recall, these include the institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labour market efficiency, financial market development, technological readiness, market size, business sophistication and innovation pillar, as depicted in Figure 5-7, Figure 5-8 and Figure 5-9 below (WEF 2017).

Whilst the latest data for Angola stems from 2013 in the 2014-2015 report, the latest data for Namibia and South Africa stems from 2016 in the 2017-2018 report. In order to provide both a comparable set of scores across countries and the latest data, the scores are described and visualised according to the following scheme: The diagrams only present the 2013 data. It must be taken into account that the macroeconomic environment has changed considerably in Angola since 2014. The textual descriptions present the 2013 data for Angola, Namibia and South Africa (WEF 2014: 108,

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66   The dft score of getting credit was already at a low level in the Doing Business 2015, whose data stems from June 2014 and was published in October 2014. Consequently, the low dft score of getting credit is not expected to anticipate effects of the looming economic crisis in Angola since the third quarter of 2014 (World Bank 2014: 114).

284, 340) as well as the 2016 data for Namibia and South Africa (WEF 2017: 214, 268).

In 2013, Angola ranked 140 out of 144 counties, Namibia ranked 88 and South Africa ranked 56 on the Global Competitiveness Index. In 2016, Namibia ranked 90 out of 137 countries and South Africa ranked 61 on the Global competiveness Index.

The institutions pillar for Angola stood at 2.6 in 2013, for Namibia at 4.2 in 2013 and 4.4 in 2016 and for South Africa at 4.5 in 2013 and 3.8 in 2016.

The infrastructure pillar for Angola stood at 2.0 in 2013, for Namibia at 4.2 both in 2013 and in 2016 and for South Africa at 4.3 in both 2013 and 2016.

The macroeconomic environment pillar for Angola stood at 4.7 in 2013, for Namibia at 4.6 in 2013 and 4.0 in 2016 and for South Africa at 4.5 in both 2013 and 2016.

The health and primary education pillar for Angola stood at 3.5 in 2013, for Namibia at 4.6 in 2013 and 4.8 in 2016, and for South Africa at 4.0 in 2013 and 4.5 in 2016.

Figure 5-7: Basic Requirements
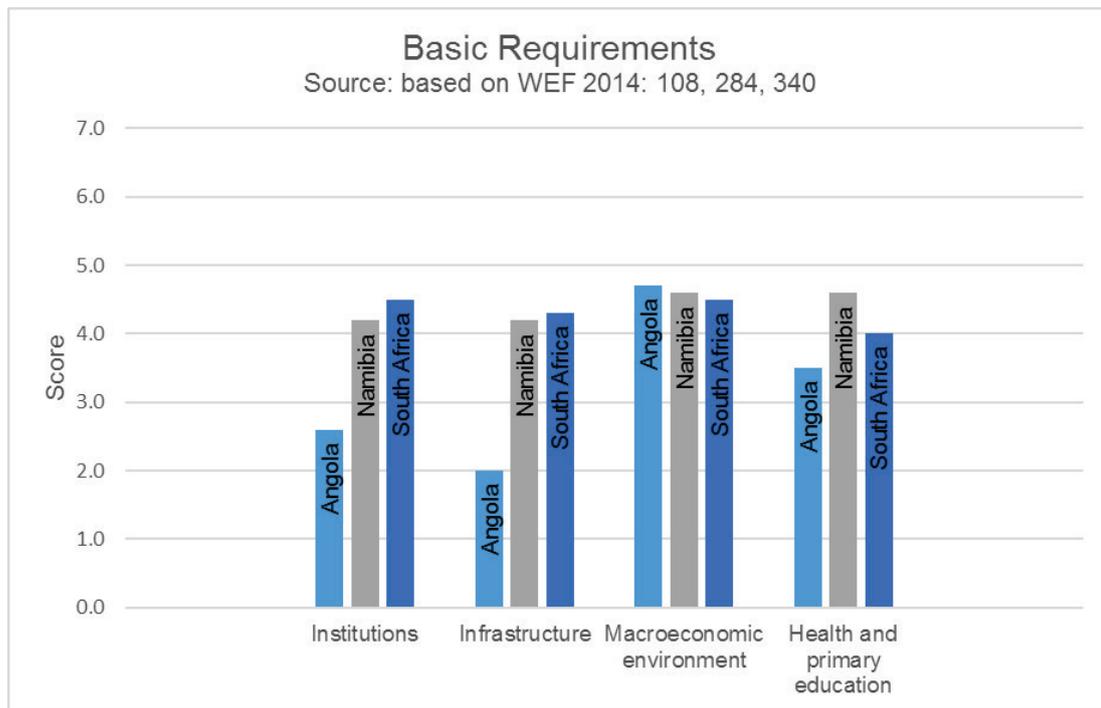
The higher education and training pillar for Angola stood at 1.9 in 2013, for Namibia at 3.2 in 2013 and 3.3 in 2016, and for South Africa at 4.0 in 2013 and 4.1 in 2016.

The goods market efficiency pillar for Angola stood at 2.9 in 2013, for Namibia at 4.1 in 2013 and 4.2 in 2016, and for South Africa at 4.7 in 2013 and 4.5 in 2016.

The labour market efficiency pillar for Angola stood at 3.5 in 2013, for Namibia at 4.3 in 2013 and 4.6 in 2016, and for South Africa at 3.8 in 2013 and 4.0 in 2016.

The financial market development pillar for Angola stood at 2.5 in 2013, for Namibia at 4.4 in 2013 and 4.2 in 2016, and for South Africa at 5.4 in 2013 and 4.4 in 2016.

The technological readiness pillar for Angola stood at 2.3 in 2013, for Namibia at 3.4 in 2013 and 3.6 in 2016, and for South Africa at 3.9 in 2013 and 4.6 in 2016.

The market size pillar for Angola stood at 3.8 in 2013, for Namibia at 2.7 in 2013 and 2.9 in 2016, and for South Africa at 4.9 in both 2013 and 2016.

Figure 5-8: Efficiency Enhancers
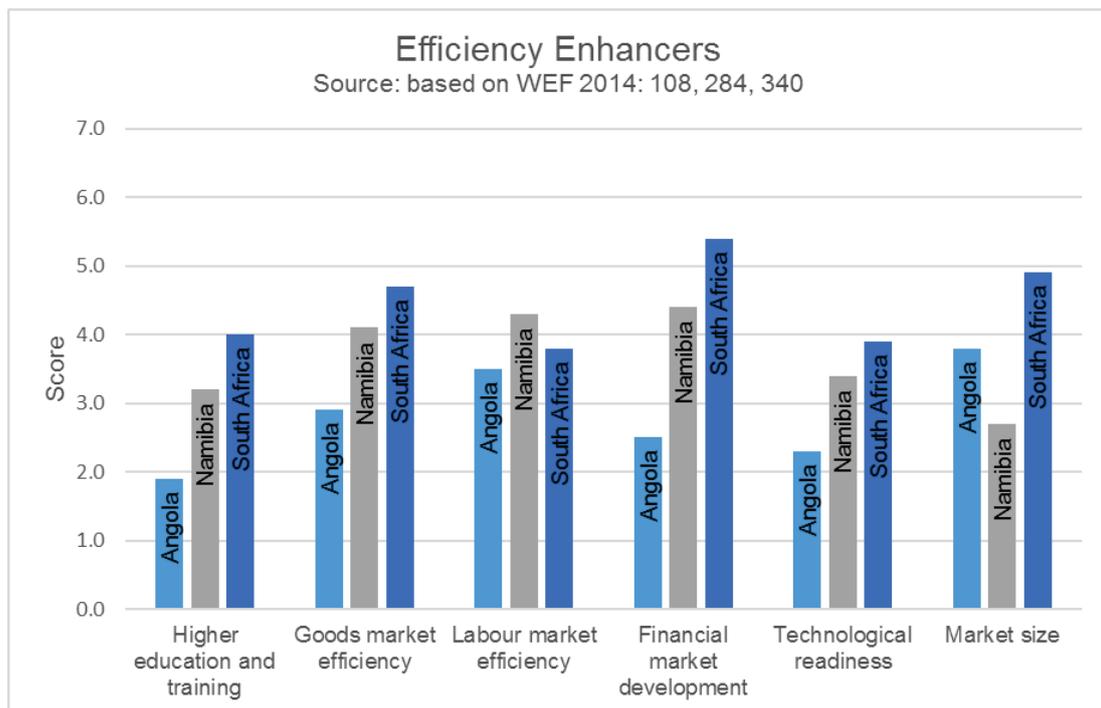
The business sophistication pillar for Angola stood at 2.6 in 2013, for Namibia at 3.7 in 2013 and 3.8 in 2016, and for South Africa at 4.5 in both 2013 and 2016.

The innovation pillar for Angola stood at 2.1 in 2013, for Namibia at 3.1 in 2013 and 3.2 in 2016, and for South Africa at 3.6 in 2013 and 3.8 in 2016.

Figure 5-9: Innovation and Sophistication Factors
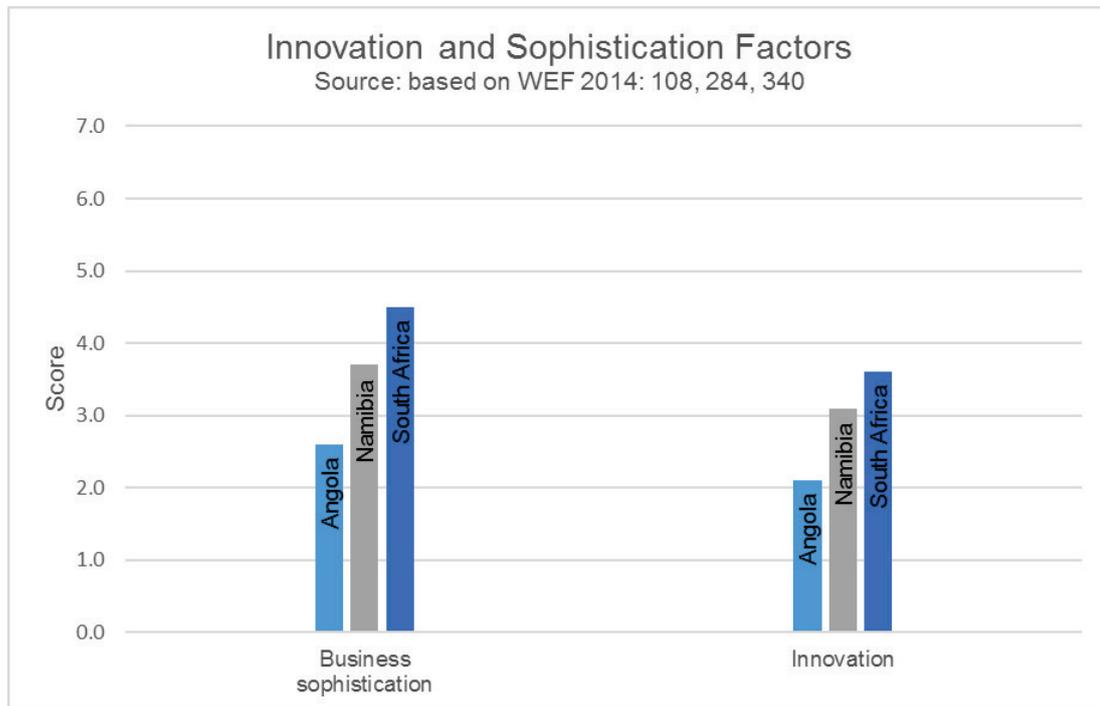
The 2013 data indicates that South Africa performs best on most indicators, Namibia performs inbetween and Angola lowest. In 2013, the macroeconomic environment in Angola was better than in Namibia and South Africa. However, it needs to be taken into account that the macroeconomic environment changed considerably in Angola in 2014 and 2015. Thus, if Angola had been taken into account in the 2016 data, the macroeconomic environment would probably score much lower. Health and primary education was slightly better in Namibia than in South Africa. Market size was much better in Angola than in Namibia.

In Angola in 2013, higher education and training (1.9), infrastructure (2.0) and innovation (2.1) indicators are relatively low. In 2013, the five most problematic factors in Angola were access to finance (19.6 % of respondents), inadequately educated workforce (19.1 %), inadequate supply of infrastructure (18.4 %), corruption (16.5 %) and poor public health (6.4%). The authors of the Global Competitiveness Report consider Angola at a transition stage of development, between factor-driven and efficiency driven. Consequently, the country should focus on improving basic requirements but also efficiency enhancers (WEF 2014: 11, 108).

In Namibia in 2016, market size (2.7), innovation (3.1) and higher education and training indicators (3.2) are relatively low. In 2016, the five most problematic factors in Namibia were access to finance (15.0 % of respondents), inadequately educated

workforce (14.4 %), inefficient government bureaucracy (11.1 %), corruption (10.6 %) as well as poor work ethic in national labour force (9.3 %). The authors of the Global Competitiveness Report consider Namibia at an efficiency-driven stage of development. Consequently, the country should focus on improving efficiency enhancers (WEF 2017: 214, 320).

In South Africa in 2016, the institutions (3.8), innovation (3.8) and labour market efficiency (4.0) are relatively low. In 2016, the five most problematic factors in South Africa were corruption (14.3 %), theft and crime (12.1%), government instability / coups (10.2 %), tax rates (7.2 %) and inefficient government bureaucracy (7.0 %). The authors of the Global Competitiveness Report consider South Africa at an efficiency-driven stage of development. Consequently, the country should focus on improving efficiency enhancers (WEF 2017: 268, 320).

Because the institutions, financial markets and goods market efficiency pillars of South Africa decreased compared to the previous report, South Africa dropped from the 39th to the 61st rank in the GCI. Nonetheless, South Africa is still the most competitive economy in sub-sahara Africa (WEF 2017: 34, 268).

5.2.4 Worldwide Governance Indicators

To gain a deeper insight into the governance of the three selected countries, this section explores the latest data on the Worldwide Governance Indicators and its six composite indicators. To recall, these include the Voice and Accountability, Political Stability and Absence of Violence / Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law as well as Control of Corruption. The 2016 data of the six Worldwide Governance Indicators is depicted in Figure 5-10 below (World Bank 2018b).

The Voice and Accountability indicator for Angola stood at -1.17, for Namibia at +0.61 and for South Africa at +0.64.

The Political Stability and Absence of Violence / Terrorism indicator for Angola stood at -0.39, for Namibia at +0.74 and for South Africa at -0.13.

The Government Effectiveness indicator for Angola stood at -1.04, for Namibia at +0.17 and for South Africa at +0.27.

The Regulatory Quality indicator for Angola stood at -1.00, for Namibia at -0.14 and for South Africa at +0.21.

The Rule of Law indicator for Angola stood at -1.08, for Namibia at +0.39 and for South Africa at +0.07.

The Control of Corruption indictor for Angola stood at -1.41, for Namibia at +0.37 and for South Africa at +0.05.

To summarise, Angola received by far the lowest score on all indicators. On some indicators, Namibia outperforms South Africa; on other indicators, the opposite is true.

In Angola, the Control of Corruption indicator received the lowest score. However, the other indicatos, namely Voice and Accountability, Government Effectiveness, Regulatory Quality as well as Rule of Law are only slightly higher. In Namibia, the Regulatory Quality received the lowest score. In South Africa, the Political Stability and Absence of Violence / Terrorism received the lowest score.

Figure 5-10: Worldwide Governance Indicators
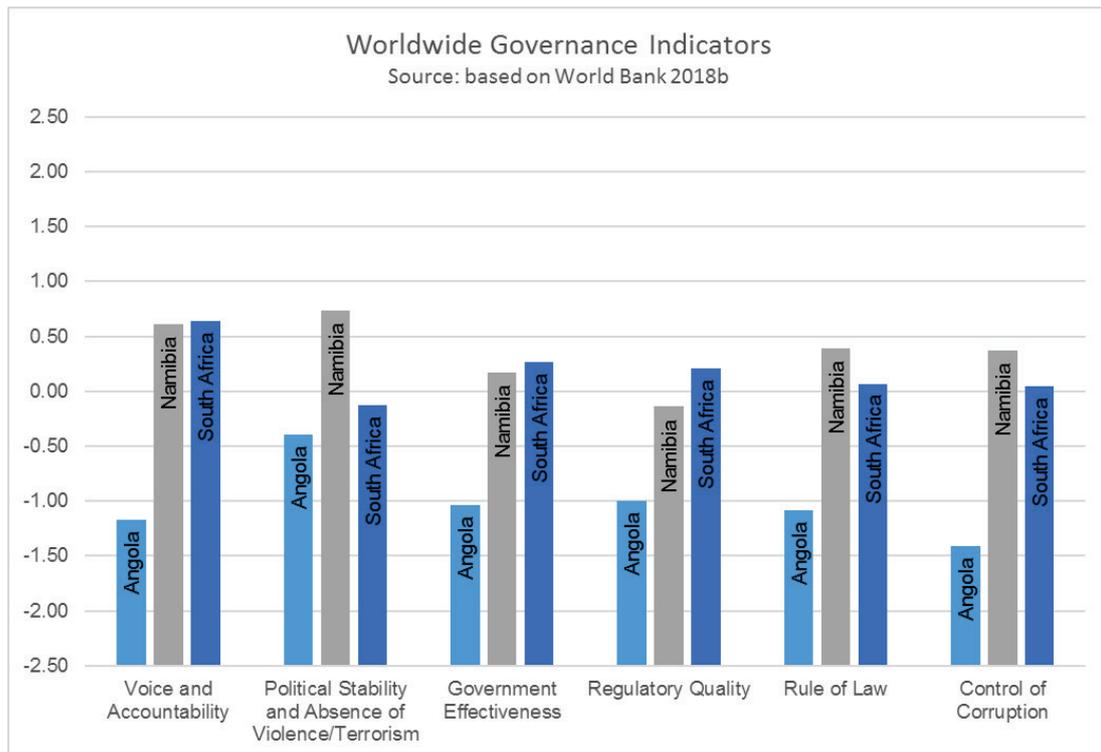
Comparisons over time from 1996 to 2016 show the following trend: Albeit from a low level, a number of indicators of Angola have improved. Only Control of Corruption and Government Effectiveness remained at a low level. Most indicators of Namibia remained stable, slightly increased or slightly decreased. A number of indicators of South Africa remained stable. The Government Effectiveness, the Regulatory Quality and the Control of Corruption decreased.

6 Expert Evidence on Constraints of Supply Chain Performance

Chapter six concentrates on the data collection. First, chapter six sets out the procedure of the selection of experts and presents the sample characteristics. Second, it analyses the parameters that interviewees take into account when making their decision on the choice of seaports, road transport networks, rail transport networks and manufacturing locations. These stated parameters are then compared to the compiled attribute structure of the questionnaire in order to assess its level of compatibility. Third, chapter six analyses the interviewee statements as well as questionnaire responses on constraints of suppy chain performance in Angola, Namibia and South Africa.

6.1 Selection of Experts and Data Collection

Prior to, as well as throughout the data collection phase, 382 people were identified as potential experts. Based thereon, 300 potential experts were purposefully selected based on a number of criteria, namely expected knowledge and experience, role of the company, industry, location and country. These experts were contacted individually via email, personal message in an online business network, phone or personally and requested for questionnaire completion and / or personal interview.

Of 300 experts in total, 135 (45 %) experts were located in South Africa, 70 experts (23 %) were located in Namibia and 63 experts (21 %) in Angola. 32 experts (11 %) were located in other countries, such as Germany, Zimbabwe, Mozambique and Portugal. The share of experts by country is depicted in Figure 6-1 below.

Moreover, an article in English, Portuguese and Afrikaans including a request to contribute to this research was published in an online business network. In addition, two local industry magazines published an article on this research project including a request to contribute to the results.

Figure 6-1: Experts by Country
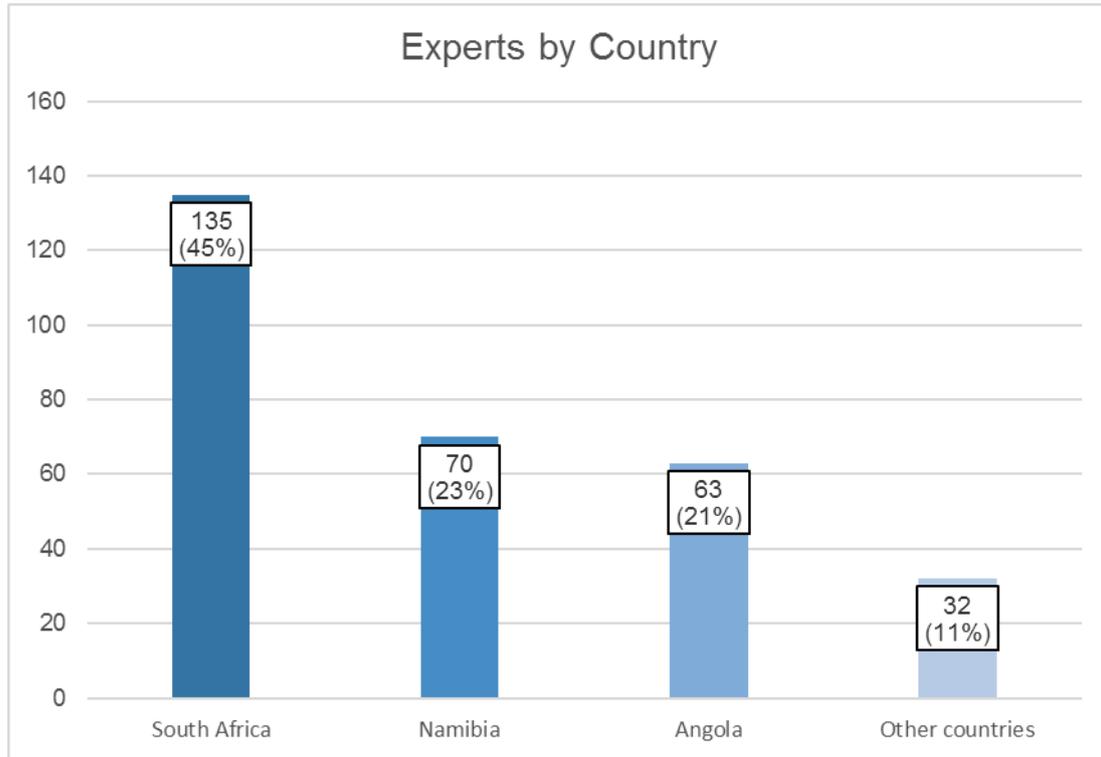
Most experts stem from three major sectors, namely 23 percent from the freight for-warding and logistics service provider sector, almost 20 percent from the research and education sector as well as 19 percent from manufacturing companies. Then, 8 percent act on behalf of service providers – consultancies and 7 percent from trade, industry or business associations. About 5 percent each work for ocean carriers, port operators and trading companies. About 3 percent each stem from rail freight carriers as well as government ministries and agencies. Finally less than one percent each stem from conglomerates, service providers in engineering and information technol-ogy as well as development agencies, as depicted in Figure 6-2 below.[67]

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67   Note that some organisations may operate within more than one field. The categories have been assigned to the organisation's major field of operation or, in case of organ-isations with multiple fields, the interviewee's major field of operation. The numbers only include people that were expected to be able contribute to the research results by means of a personal interview or questionnaire completion, i.e. so-called experts.

Figure 6-2: Experts by Sector
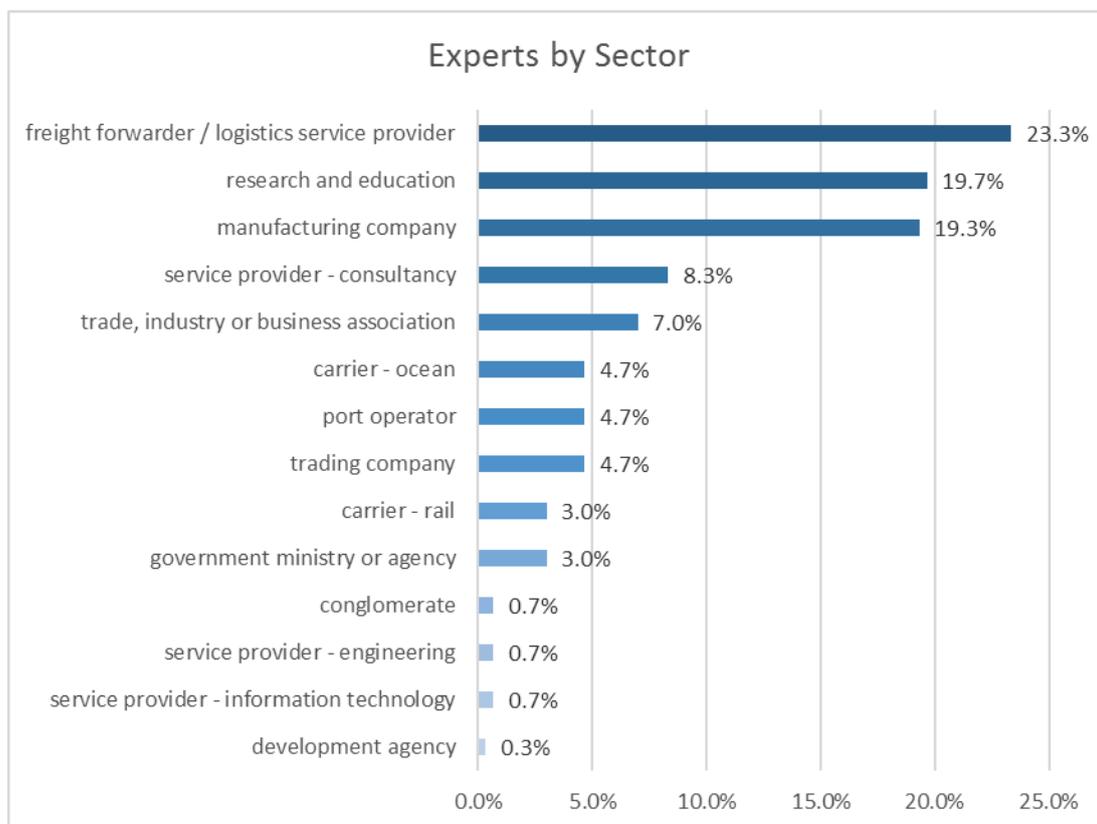
Between May 2016 and December 2016, 45 responses to the questionnaire were provided. Between May and August as well as November and December 2016, 42 qualitative interviews were conducted in Angola, Namibia and South Africa. Whilst the number of questionnaire completions does not meet the expectations and clearly sets limits to the analysis, the number of interviews is entirely satisfactory. Below the line, the data collection provided a comprehensive base of information.

Each interview took between one hour and three hours. Whilst most interviews took about 1.5 hours, those that took less time were limited upfront by the interviewee. Each interviewee was informed about the purpose of the interviews and the research project upfront by means of a management summary as well as if desired by means of a list of interview topics. Confidentiality of personal details was granted.

Prior to the interview phase, the type of interview documentation – whether interviews are documented in written form only, in acoustic form, or both in written and acoustic form – was weighed up and discussed project-internally. Because of the risk that interviewees may avoid statements, which may not appeal to everyone and may cause opposition as well as because of the high importance of this type of information to this research, it was decided to start with a written-only documentation and after a couple

of interviews to review the type of documentation.[68] Despite the fact that interviewees seem to be more sensitive to what they state, the documentation in written and acoustic form turned out to provide a denser base of information. Thus, from then on the interviewees were asked upfront for their agreement to record the interview acoustically. They were informed about the option to stop the recording at any time. Only a single interviewee disagreed to acoustic documentation.

Likewise, prior to the interview phase, the procedure to document the interviews was discussed project-internally. The notion was held that due to the focus on process knowledge, there is no stringent necessity do transcribe the interviews. In addition, due to the expected high number of interviews along with the limited human resources of this project, there was the requirement to strike a balance between adequate documentation on the one hand and economic feasibility on the other hand. Based on the previous considerations, it was decided to document and process interviews as follows: Based on the simultaneous and memory notes as well as audio recordings, first, the statements of interviewees were paraphrased. Second, from the paraphrased statement, the explicit and implicit statement was retrieved. In case of unambiguous statements, the information was retrieved directly; in case of ambiguous statements, the statement was interpreted. Third, the retrieved information was reduced to its core. Whilst the information to question one was reduced to decision parameters, the information to the subsequent questions was reduced to a core statement. To ensure that interviewees do not face any disadvantages as a result of their survey participation, neither names of interviewees nor company names are presented.[69]

Having presented procedural details, now, chapter six puts the relevant pieces of information together in order to create a comprehensive and coherent picture on constraints of supply chain performance in Angola, Namibia and South Africa.

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68   The first attempts to schedule personal interviews provided reasons to believe that obtaining interviewees and, in particular, getting permission to record the interviews acoustically may turn out to be difficult. For instance, because of the difficult economic situation in Angola, a potential interviewee rejected the request for an interview. The person predicted that it will be difficult to get any non-public information and stated that even their company has difficulties getting relevant market information in Angola.

69   Note that the interview documentation is provided in the appendix publication.

6.2 Analysis of Decision Parameters

First, this section presents the factors that interviewees took into account when making their choice on a seaport, road transport network, rail transport network as well as manufacturing location.[70] Second, these factors are then compared to the attributes that were – by means of a document analysis – compiled to construct an instrument to measure the importance and performance of each attribute by supply chain domain. Ideally, the specified factors fit well to the compiled attribute structure.

Some interviewees started by describing their choice on the general mode of transport. Therefore, this section begins by exploring factors that guide the choice on the transport mode and then moves on to examine factors that guide the choice of a seaport, road transport network, rail transport network and manufacturing location.[71]

6.2.1 Mode of Transport

This section presents the parameters on the choice of of a mode of transport.[72]

The decision that needs to be made first is the decision on the mode of transport, so whether it is maritime, road, rail or air transport or intermodal transport. On the one hand, the characteristics of goods, i.e. monetary value, cargo weight, cargo volume, the ability to bear logistics costs as well as the requirements of goods, i.e. time-criticality and transport distance are important factors. On the other hand, the characteristics of the transport mode, i.e. transport speed, capacity, transport time, functioning of transport modes, predictability of the transport time, safety of goods during transport, flexibility as well as frequency are important factors.

A number of additional factors need to be taken into account. First, due to the low income of the average population in southern Africa, goods are not able to carry high logistics costs. It depends, however, on the characteristics of the business case.

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70   The following analysis rests upon the interviewee statements, as documented in the appendix publication. A table in the footnote at the beginning of each section presents the references to the appendix. Whilst the numeric character refers to the number of the interviewee, the alphabetic character refers to the number of the statement.

71   Unless specified, this analysis treats the terms importance and determinance interchangeably.

72   Reference table to the appendix publication, as explained in footnote 70 on page 134.

1a	1b	3a	5a	5b	10c	13b	18a	21a	21b
21c	24a	26b	37b	37d	41a				

Whilst usual stock replenishment requires maritime or road groupage freight, urgent cargo may justify dedicated vehicles or airfreight. There is a trade-off between costs and time. Provided that transport requirements are met, the costs of transport decides on the mode of transport. In place of direct transport costs, total logistics and total supply chain costs are becoming more important. Second, maritime transport requires additional pre- and on-carriage, compared to continual road transport. This causes additional distance, time and costs for sea- / road intermodal transport and needs to be taken into account as well. Third, deficiencies in transport performance of one mode of transport may affect the attractiveness of other modes of transport, as in the case of road and rail.

Consequently, it appears that characteristics of goods, transport requirements of goods as well as characteristics of transport modes prescribe suitable modes of transport. The final choice hinges on the total transport and supply chain costs.

6.2.2 Seaports

This section presents the parameters on the choice of seaports[73] as well as importance values of seaport attributes.

Some interviewees state that there is only a single seaport and that port is chosen. A number of differently characterised ports does not exist. Other interviewees name a number of factors that guide their choice of a seaport.

The ability of a port to handle the required type of cargo is of importance. The requirements of goods to a port affect the choice of a port. There is a specialisation of ports on certain types of goods. Ports have aligned their business to the type of goods that prevail in that region. A critical volume of goods is necessary to handle that type of cargo. There is almost an unrivalled specialisation of ports on specific goods and industries.

The requirements of a vessel with regard to length, width and draft are of importance. The port dimensions need to meet the mininmum vessel requirements.

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73   Reference table to the appendix publication, as explained in footnote 70 on page 134.

1c	3b	4a	4b	4c	4d	8a	8b	9a	10a
13a	13c	15a	15b	15c	15d	15e	15f	20a	22a
22b	22c	22d	22e	23a	23c	23d	26a	26c	26d
28a	29a	37a	37c	42a	42b				

The connectivity of a port to shipping lines and other ports is an important factor. This includes the availability of direct sailings as well as the frequency of port calls. In particular, the connectivity to specific ports of origin or destination is of importance. Since some ports are closer to the port of origin or destination, these ports allow for a lower maritime transport distance and a shorter transport time.

The terminal and port performance play an important role in the choice of a seaport. Interviewees refer to port lead time, vessel turnaround time, efficiency of operations, terminal operating hours, customs lead time, organisation of berthing, loading, unloading and yard operations, vessel waiting time, reliability of port services as well as state of the infrastructure and handling equipment.

The occurance of congestion, vessel waiting time and resulting delays are taken into account as well. Port capacity needs to be available.

Since ports and port operations show differences in their susceptibility to weather conditions, the weather-dependent seaward accessibility is an important factor as well.

The costs of port services, i.e. the port dues, play an important role. The importance of port dues may even outweigh the importance of distance and time. The efficiency of a port and the economies of scale in turn affect the costs and, thus, port dues. Other interviewees state that what matters is the sum of costs that occur along a port corridor.

The distance to the port, i.e. the distance of the pre-carriage as well as the distance of the on-carriage are important factors. Interviewees also refer to the distance to the hinterland, to the distance to the market and to the convenience of the port location. Important in this regard is also the size of the market that a seaport is able to service.

The transport to the port hinterland is a factor in the choice of a seaport. Interviewees point to the state of the transport infrastructure, in particular to road transport infrastructure, the reliability of transport, the predictability of transport, the transparency of transport, the costs of transport, transport time, the efficiency of transport as well as waiting time at border crossings to the hinterland countries. The performance of a seaport highly depends on the performance of the entire transport corridor.

The transport modes that are available have an influence on the choice of a seaport. Interviewees expect the availability of road transport. Rail transport could extend the

economic hinterland of a port and allow for on-carriage to neighbouring countries. The reach of the hinterland is taken into account as well.

Regarding cross-border hinterland transport, the number of border crossings to the destination, the time it takes to cross the border as well as the variability in time matter.

The availability of dry ports for neighbouring countries is considered as a conducive factor. The relation to neighbouring countries as well as cooperation with neighbouring countries is seen as a factor that supports the choice for a specific a seaport.

The security on the foreland of ports, e.g. with regard to piracy, is regarded as an important factor. This factor is, however, less important in the choice among southern African seaports.[74]

The frequency of loss of cargo, security at the port, as well as corruption affect the choice.

The safety of cargo handling operations is of importance.

Interviewees point out that the location of a company's headquarters, i.e. the location where the decision on the transport routing is made, has an influence on the choice. In addition, decision makers tend to stick to their traditional seaport and trade routes.

The ease of doing business at a port location is a determinant in the choice as well.

Consequently, whilst some interviewees state that due to the low number of seaports for a specific type of good there is no choice between seaports, other interviewees provide a number of factors based on which they make their choice on a seaport.

The above stated factors cover all attributes of the compiled attribute structure, i.e. infrastructure, operations, public policies and services, seaward accessibility as well as landward accessibility. There is a high degree of consistency between the factors and the attribute structure. Some factors have not been taken into account in the attribute structure, such as the location of the decision maker, adherence to traditional trade routes as well as international relations. These seem to play an important role in the seaport choice as well. Some interviewees focussed – instead of functions – on performance indicators, such as time and costs. However, instead of a performance

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74   Since security of port foreland seems to be taken for granted in southern African waters it would be reasonable here to rely on Myers' & Alpert's (1968: 13-14) terminology and refer to security of the port foreland as an important but not-determinant factor.

indicator-oriented design, a function-oriented design coins the attribute structure. Interviewees concentrated on a snapshot of port performance and mentioned only few medium to long-term, i.e. strategic, factors. All in all, the attribute structure can be considered as a sound framework for measuring the importance and performance of seaports in southern Africa. There is no need for additional adjustments or remarks.[75]

Now, this section moves on to look at the importance respondents of the online questionnaire assigned to the five attributes. Figure 6-3 below illustrates the relative importance values that interviewees assigned to the determinants of port performance. 18 respondents completed the seaports section. The operations have the highest influence on the choice of a seaport (33.7 %), followed by infrastructure (24.4 %), seaward accessibility (16.9 %), landward accessibility (13.4 %) as well as public policies and services (11.6 %).[76] None of the attributes is of low importance; all attributes have a considerable degree of determinance.

Figure 6-3: Importance Values of Seaport Attributes

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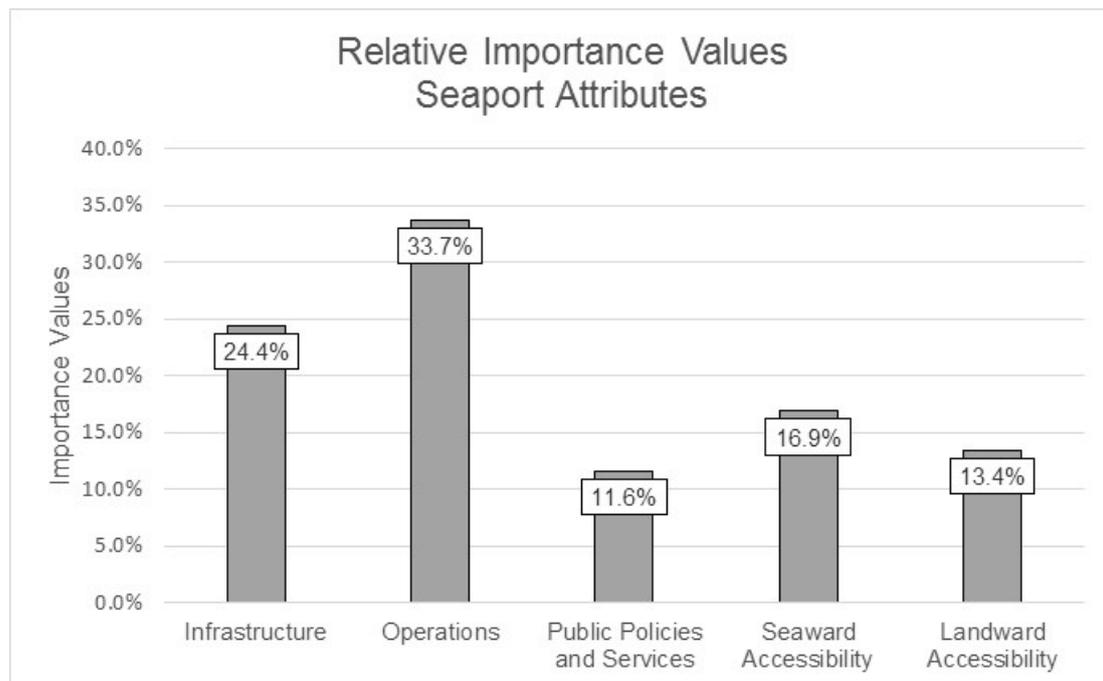
75   This has been confirmed by a scholar who made use of a traditional conjoint analysis focussing on seaports and who faced similar trade-offs with regard to the selection of attributes and the questionnaire implementation (in this case, a paper-based survey). The scholar confirmed the appropriateness of the compiled attribute structure.

76   The probability of error is lower than 0.001, suggesting a rejection of the null hypothesis of no correlation between the observed and the predicted values. Kendall's Tau correlation coefficient is 0.824 indicating a positive, high correlation between the observed and the estimated ranks.

These relative importance values are complemented by the performance values on seaports in Angola in section 6.3.1.1, Namibia in section 6.3.2.1 and South Africa in section 6.3.3.1.

6.2.3 Road Transport Networks

This section presents the parameters on the choice of road transport networks[77] as well as importance values of road transport network attributes.

Some interviewees state that there is no choice between transport routes. The only route that exists between origin and destination is chosen. Other interviewees name a number of factors that affect their choice of a transport network or route.

The origin of freight and the source of supply is of importance. The port of entry to southern Africa co-determines the transport route. Good port performance as well as good transport infrastructure provide alternative transport routes.

The distance as well as the transport time of a transport route are of importance. Transport time is particularly important in case of perishable and urgent freight. Variation in transport time is of importance as well. Particularly because of high distances, the costs per distance are important. Because of high distances, increases in efficiency have a high leverage-effect on the costs. The costs are more important than time.

The transport volume as well as the availability of transport capacity affect the choice of a transport route. If possible, freight is allocated to planned routes.

The availability of distribution centres to ensure short replenishment is important in remote areas. Distribution centres in turn require electricity supply.

The state of the road transport infrastructure plays a role in the choice of the route.

The risk of crime on routes, i.e. freight security, as well as corruption is taken into account as well.

The existence of favourable trade agreements affects which country goods are imported into and thereby decides on the transport routes.

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77   Reference table to the appendix publication, as explained in footnote 70 on page 134.

7a	10b	19a	22d	23e	24a	26a	26c	27a	27b
27c	29b	31a	37d	37e					

The number of border crossings, the degree of functioning of border crossings, the existence of cross-border corridors have an influence.

In addition to factors of the choice of a road transport routing, interviewees specified factors that guide their choice on a transport operator. These include the price and costs of transport services, transport requirements and service portfolio of the service provider, affirmative action status of the service provider, transport efficiency, transport time, transport quality as well as the reputation of the service provider. The service portfolio of the service provider includes the serviced route as well as transport equipment, such as refrigerated lorries. The specified factors on the choice of a transport operator have at least an indirect effect on the choice of a transport routing.

The above stated factors cover all areas of infrastructure, i.e. infrastructure, equipment and facilities, transport operations, public policies and services as well as transshipment centres. Like in the case of seaports, some interviewees focussed on performance indicators, instead of functional components. Likewise, some interviewees concentrated on a snapshot of road transport network performance and mentioned only few medium to long-term, i.e. strategic, factors. In addition, some specified factors are more precise, i.e. at a higher level of detail than the attribute structure and their sub-attributes. All in all, the attribute structure is regarded as a sound framework for measuring the importance and performance of road transport networks in southern Africa.

Now, this section moves on to look at the importance respondents of the online questionnaire assigned to the five attributes and their sub-attribute examples. Figure 6-4 below illustrates the relative importance values that interviewees assigned to the determinants of road transport performance. 16 respondents completed the road transport performance section of the online questionnaire. Infrastructure has the highest influence on the choice of a road transport network (36.7 %), followed by equipment and facilities (24.3 %), transport operations (19.5 %), public policies and services (14.3 %) as well as transhipment centres (5.1 %).[78]

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[78]   The probability of error is lower than 0.001, suggesting a rejection of the null hypothesis of no correlation between the observed and the predicted values. Kendall's τ correlation coefficient is 0.795 indicating a positive, high correlation between the observed and the estimated ranks.

Figure 6-4: Importance Values of Road Transport Network Attributes
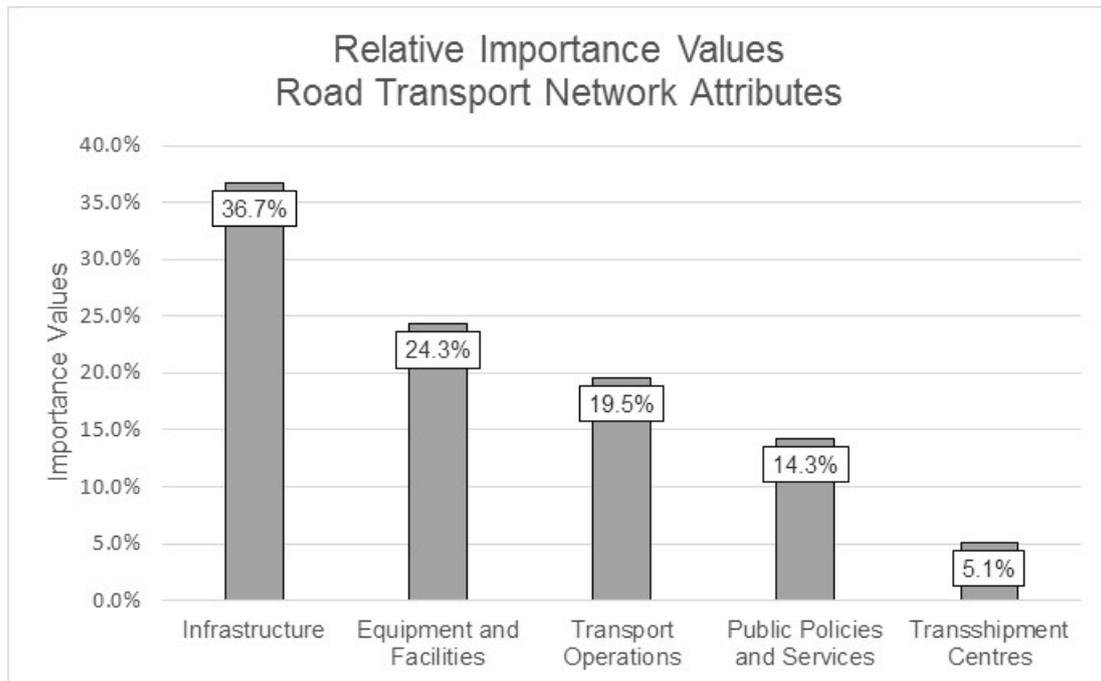
These relative importance values are complemented by the performance values on road transport networks in Angola in section 6.3.1.2, Namibia in section 6.3.2.2 and South Africa in section 6.3.3.2.

6.2.4   Rail Transport Networks

This section presents the parameters on the choice of rail transport networks[79] as well as importance values of rail transport network attibutes.

Interviewees primarily focussed on the choice between road and rail transport.

The availability of rail transport operations between seaports and neighbouring countries is a factor in the choice of a seaport and, thus, of rail transport networks as well.

The functioning of a transport mode is an important factor. Since the functioning varies on different rail transport networks, the functioning of a rail transport network plays a role.

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79   Reference table to the appendix publication, as explained in footnote 70 on page 134.

10c	15b	18a	21c	41a					

Interviewees specified factors that speak against rail transport, such as high rate of theft at rail yards, freight damages during cross-border rail transport and the focus on direct transport costs instead of total logistics costs.

The low number of specified factors that affect the choice of a rail transport network could indicate that the interviewees usually do not make a choice between rail transport networks, but only focus on the modal choice between road and rail transport. The limited number of alternatives or lack of alternatives in rail transport networks and routes may make the choice less obvious. Based on this low number of specified factors as well as on the finding of the factors that decide on the choice of transport modes and road transport networks, it can only be assumed that the attribute structure reflects the factors that interviewees take into account when making a choice on a rail transport network well.

Based on this assumption, this section now moves on to look at the importance respondents of the online questionnaire assigned to the five attributes and their sub-attribute examples. Figure 6-5 illustrates the relative importance values that interviewees assigned to the determinants of rail transport performance. Four respondents completed the rail transport section. Infrastructure has the highest influence on the choice of a rail transport network (32.2 %), followed by equipment and facilities (26.9 %), public policies and services (15.7 %), transport operations (13.1 %) and transhipment centres (12.0 %).[80]

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80   The probability of error is lower than 0.001, suggesting a rejection of the null hypothesis of no correlation between the observed and the predicted values. Kendall's τ correlation coefficient is 0.891 indicating a positive, high correlation between the observed and the estimated ranks.

Figure 6-5: Importance Values of Rail Transport Network Attributes
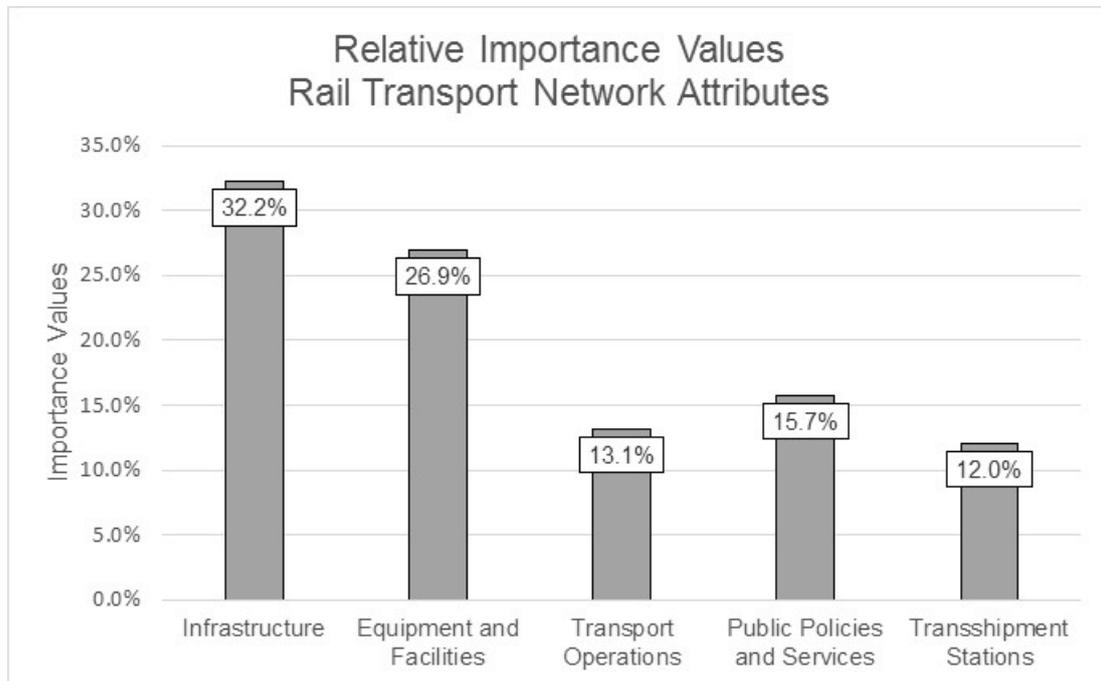
These relative importance values are complemented by the performance values on rail transport network in Angola in section 6.3.1.3, Namibia in section 6.3.2.3 and South Africa in section 6.3.3.3.

6.2.5 Manufacturing Locations

This section presents the parameters on the choice of manufacturing locations[81] as well as importance values of manufacturing location attriubtes.

Some interviewees state that on the one hand, the distance and the transport costs to customers are of importance. On the other hand, the distance and transport costs to suppliers are of importance. Other interviewees add that the decision on a new manufacturing location depends on the characteristics and transport requirements of the relevant good. The manufacturing sites could be located close to the market in order to reduce the transport distance to the market. Alternatively, the manufacturing sites could be located close to the base of suppliers in order to reduce transport distance to suppliers and make use of economies of scale in manufacturing.

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81   Reference table to the appendix publication, as explained in footnote 70 on page 134.

10d	11a	12a	25a	25b	25c	25d	31a	31b

The availability and costs of input services and materials, such as water, electricity and transport services plays a role in the choice of a manufacturing location.

The transport infrastructure, the local and regional transport network accessibility, proximity to seaports, access to road and rail transport networks as well as transport distances and costs are of importance.

The availability of a skilled workforce is a factor in the choice of a manufacturing location.

Public policies are of importance. Interviewees refer to location incentives, free trade zones, tax rebates and industrial zones as well the availability and arrangement of industrial policies.

The weather and climate need to be conducive to the business of the company. For instance, a harsh climate may make maintenance of manufacturing sites difficult.

Eventually, what is important are the total logistics and total supply chain costs.

The above stated factors cover all attributes of the given attribute structure, i.e. local infrastructure, manufacturing sites, public policies and services, economic agglomeration as well as transport network accessibility. There is a high degree of consistency between the factors and the attribute structure, although the specified factors are less comprehensive than the attribute structure. Some factors have not been taken into account in the attribute structure. These include weather and climate factors. Like in the case of seaports, road transport and rail transport networks, some interviewees focussed on performance indicators such as costs. All in all, the attribute structure is regarded as a sound framework for measuring the importance and performance of manufacturing locations in southern Africa.

Now, this section moves on to look at the importance respondents of the online questionnaire assigned to the five attributes and their sub-attribute examples. Figure 6-6 illustrates the relative importance values that interviewees assigned to the determinants of manufacturing location performance. Three respondents completed the manufacturing location section. The manufacturing sites have the highest influence on the

choice of a manufacturing location (33.6 %), followed by transport network accessibility (20.9 %), public policies and services (20.5 %), local infrastructure (17 %) as well as economic agglomeration (8.0 %).[82]

Figure 6-6: Importance Values of Manufacturing Location Attributes
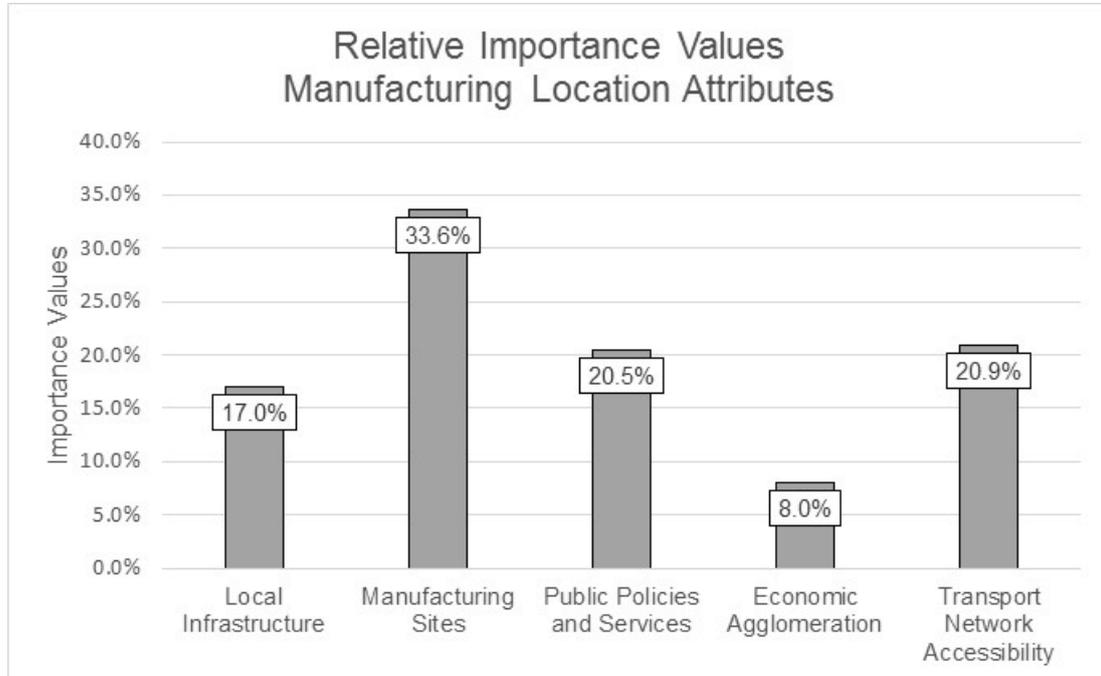
These relative importance values are complemented by the performance values on manufacturing locations in Angola in section 6.3.1.4, Namibia in section 6.3.2.4 and South Africa in section 6.3.3.4.

6.2.6 Results of Analysing Decision Parameters

In seaports and manufacturing locations, there is a high degree of consistency between the specified factors and the compiled attribute structure. In road and rail transport, interviewees primarily focussed on the decision between these two modes of transport as well as on aggregated performance indicators. This result may stem from the fact that in seaport and manufacturing locations, there is an obvious decision between locations. Within road and rail transport, the choice may be less obvious and / or the scope of options smaller.

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82   The probability of error is lower than 0.001, suggesting a rejection of the null hypothesis of no correlation between the observed and the predicted values. Kendall's τ correlation coefficient is 0.764 indicating a positive, high correlation between the observed and the estimated ranks.

In general, highly aggregated performance indicators, such as time and costs have been stated as the most important attributes in the choice. By contrast, as set out earlier, the attribute structure of the questionnaire consciously embraces a function-oriented design and aggregated performance indicators have been excluded from the attribute structure. However, since the attribute structure implies a higher preference of higher performance levels, the specified factors and the attribute structure go well together.

An essential aspect to note at this stage is that, ideally, the decision parameters would have been analysed differently by groups or clusters of respondents, such as country, region or industry or even business cases. A differentiated analysis could have revealed differences in the importance that different respondents assign to the attributes. However, the low number of responses does not allow for a clustering of responses. The low number of responses limits the scope of data analysis.

6.3 Analysis of Weaknesses of Supply Chains

This section puts the two sources of expert information together in order to obtain a comprehensive and coherent picture of weaknesses of supply chains as well as areas, actions, responsibilities and obstacles of further improvements of supply chain performance in Angola, Namibia and South Africa.[83] Note that the information reflects the experts' opinions; it was attempted to keep the researcher's impact to a minimum.

6.3.1 Angola

This section sheds light on the various statements that interviewees made with regard to weaknesses, areas and actions for improvements, obstacles as well as responsibilities of seaport, road transport network, rail transport network as well as manufacturing location performance in Angola. Moreover, it presents and interprets the combined importance and performance attribute values of each domain in Angola.

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83   Note that the following statements rest upon the interviewee statements, as documented in appendix publication. A table in the footnote at the beginning of each section presents the references to the appendix. The first two letters specify the country using the ISO Alpha 2 country code (AO for Angola, NA for Namibia, ZA for South Africa), the subsequent numbers specify the interviewee and the last two numbers specify the statement.

6.3.1.1 Seaports

The core statements on seaports are sorted according to the following sections, namely, port performance, port process time, infra- and suprastructure, port management and organisation, education and workforce, hinterland transport as well as cross-cutting issues. The presentation of statements in categories is followed by the presentation and interpretation of combined importance and performance values of seaport attributes.

Port performance

This section presents the core statements on port performance.[84]

Since the end of the war, ports in Angola have been and are still being rehabilitated as well as developed. For instance, the port of Lobito, the port of Namibe as well as the port of Cabinda are being rehabilitated. Since then, significant improvements in port performance have been achieved. The number of shipping lines that call at ports went up and cargo volume at ports increased in Angola.

Whilst some interviewees state that the performance of the port of Luanda is poor, others state that the performance of the port of Luanda is fair or even good. Yet other interviewees state that the performance of the port of Luanda is neither very good nor very poor. The performance varies significantly among terminals of the port of Luanda. The performance of a specific terminal at the port of Luanda, the Sogester terminal, is good. Over the last ten years, the performance of the port of Luanda has improved. There is much room for improvement. Some interviewees state that the performance of the port Lobito is good and even much higher than the performance of the port of Luanda. Other interviewees state that the performance of the port of Lobito and Namibe is poor. Because of the ongoing expansion, the performance of the port of Cabinda can only be evaluated after completion. Due to the investment at the port of Cabinda, interviewees expect significant increases in port handling volumes within the next years. Performance varies significantly among ports and port terminals in

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84   Reference Table to the appendix publication, as explained in footnote 83 on page 146.

SA-35-02	AO-01-01	AO-29-15	AO-30-09	AO-30-10	AO-32-09
AO-32-11	AO-32-14	AO-33-06	AO-33-08	AO-35-03	AO-35-04
AO-35-05	AO-35-06	AO-36-10	AO-36-18	AO-36-19	AO-42-01
AO-42-04	AO-42-05	AO-42-06	AO-42-08	AO-42-11	AO-42-15

Angola. There are still many weaknesses at ports, for instance at the port of Luanda, Lobito and Cabinda. Despite increasing port handling volume at the port of Lobito and its high potential, the port of Lobito still suffers from many weaknesses.

The ports are the best developed, best performing as well as most transparent part of supply chains in Angola. However, port performance in Angola falls short of their counterparts in southern Africa, such as the port of Walvis Bay, and in developed regions outside of the African continent, such as in the United Kingdom or in China.

The upward trend in port performance lasted until the end of 2014. The outbreak of the economic recession in Angola led to a significant decline in port handling volume and business. From 2015 to 2016, on average, port handing volume dropped by 50 percent. Some types of cargo even dropped by 80 percent in handling volume. Consumers and companies do not have the necessary funds and foreign exchange anymore to import. The current low maritime transport and port volume pose a risk to the frequency and availability of direct sailings to Angolan ports. A reduction of the sailing frequency and availability of direct sailings would lead to a higher maritime transport time and, eventually, lead to an even higher overall goods supply time. The scarcity of funds and foreign exchange impedes the redevelopment of the port of Lobito.

Interviewees plead, however, that because of smaller sizes of vessels that call at ports in southern Africa compared to Europe, the requirements to port performance are lower in southern Africa than in Europe. Often, not insufficient port performance constrains improvements in supply chain performance in southern African countries, but rather an insufficient link between the ports and their hinterland transport systems.

Port process time

This section presents the core statements on port process time.[85]

The pre-berthing waiting time of vessels is high at some ports, for instance at the port of Luanda and, with two to three weeks, even more pronounced at the port of Cabinda.

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85   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-29-03	AO-29-04	AO-29-05	AO-29-14	AO-29-16	AO-29-17
AO-32-10	AO-32-12	AO-32-13	AO-33-02	AO-33-03	AO-33-04
AO-33-05	AO-33-06	AO-33-07	AO-34-05	AO-34-06	AO-34-07
AO-34-08	AO-35-03	AO-35-07	AO-36-06	AO-36-07	AO-36-10
AO-36-11	AO-36-18	AO-42-12	AO-42-13	AO-42-18	AO-42-24

The high pre-berthing waiting time is traced back to the fact that the number of vessels and the volume of cargo exceed the vessel and cargo handling capacity of the port of Luanda. However, since the end of 2014, the economic recession and resulting significant decline in the number of vessels and cargo volume eliminated congestion at the port of Luanda and Cabinda. The ongoing expansion is expected to sustainably reduce high waiting time at the port of Cabinda.

The cargo handling time at the port of Luanda is high; in contrast, handling time at the port of Lobito is low. Like the high waiting time, the high cargo handling time at the port of Luanda is traced back to the fact that prior to the economic recession the number of vessels and the cargo volume exceeded the vessel and cargo handling capacity of the port of Luanda. Moreover, a low crane productivity causes high loading and unloading time of vessels at the port of Luanda, Cabinda, Lobito and Namibe.

The import time is high at the port of Luanda; in contrast, import time is low at the port of Lobito. Interviewees point out that the ocean carriage from Europe to Angola takes 22 days; the port handling and import process take an additional 15 to 20 days at the port of Luanda. Other interviewees state that import processes take at least two weeks. Interviewees give a number of reasons for high import time at the port of Luanda:

First, high import time at the port of Luanda is attributed to a lack of port handling capacity. The port of Luanda is in need of higher capacity.

Second, high import time is attributed to the fact that demand for storage capacity exceeds the supply of storage capacity. The lack of storage capacity leads to additional cargo transfers from the port to dry ports, which in turn lead to additional effort, time and costs. Often, consignees are not informed about the transfer to the dry port. Interviewees state that there is a need for higher visibility of cargo at ports as well as at dry ports. Like in other countries, tools for locational identification of cargo could be adopted in Angola as well.

Third, high import time is attributed to high import licensing and certification as well as customs clearing process time. The administrational effort in Angola is not higher than in Portugal or France, but there is a lack of capacity at customs and ministries. High import time is caused by a lack of incentives to reduce import time or even the existence of incentives to increase import time. Interviewees report that although standard operating procedures exist at the port of Luanda, if customers are willing to

provide additional payments, freight forwarders are able to circumvent formal proce-
dures and prioritise shipments. To some interviewees the relationship between cus-
toms officials and freight forwarding agents is intransparent. Similarly, additional stor-
age time allows operators to collect higher charges from customers. Other interview-
ees point out that corruption at customs is very low in Angola. Good salaries of cus-
toms officials prevent the need of customs officials to look for alternative sources of
income. That stands in contrast to the level of corruption of customs officials in many
other countries on the African continent.

Interviewees oppose that high import time only occurs if importers do not comply with
import regulations. Interviewees argue that import regulations are simple and publicly
available; importers only need to comply. Importers can expect a reasonable import
time if they comply with the import regulations. However, if they do not comply, they
tend to blame import regulations. Other interviewees remark that in the past, immature
import regulations along with an insufficient supply of information about changes in
customs regulation to port users caused non-compliance and led to additional import
time. This constraint does not, however, exist anymore. Interviewees state that cus-
toms clearing offices do not operate at the weekend. Thus, non-cleared goods cannot
cross the border and need to wait for working days. This increases the time to release
and pick up goods at the port. The government is responsible for provoking an exten-
sion of customs operating hours.

Apart from a lack of capacity at customs, some interviewee state that customs clearing
time is good in Angola. Customs is one of the well-performing public organisations in
Angola. Some years ago, a foreign consultancy assisted by implementing new cus-
toms processes and training customs staff in Angola.

Fourth, in the past, high import time was also attributed to inefficient payment pro-
cesses of port and customs duties. However, since a new IT system allows online
invoicing and payment, this constraint does not exist anymore. The good performance
of the banking system in Angola contributes to the good performance of the payment
of port and customs duties. Since the end of the war, significant improvements have
been achieved in the banking system.

Fifth, high import time is attributed to high inspection time of food imports. A govern-
ment-mandated private company physically inspects every single shipment. Since the
drop in port handling volume, more time is spent on the remaining cargo. There is no
limitation is the inspection duration per shipment. Additional costs from excessively

high import time may reach a threshold, which cannot be transferred to the customer anymore and may make imports economically unfeasible. This would impede the supply of import goods even further and harm the business of companies in Angola.

Yet other interviewees state that from the vessel to the warehouse it takes five to ten days or, if everything is correct, three to five days.

It takes less time to import goods than to export goods; the export time is high in Angola. It takes at least seven days to export goods, from warehouse to the vessel. High export time is attributed to a lack of established and routined export processes. A few years ago, almost no goods were exported through Angolan ports. It is only now that goods are increasingly exported. The export volume is still low. However, an export routine is being established. There is a huge imbalance between import and export volumes at ports in Angola.

Berth windows are in use at the port of Lobito and many other ports around the world. An introduction of berth windows would improve vessel and cargo handling operations at the port of Luanda.

Infra- and suprastructure

This section presents the core statements on infra- and suprastructure.[86]

During the war, the equipment of the port of Namibe was destroyed, but is being reconstructed.

Interviewees report that with 12.5 and 11 metres, respectively, the water depth of port basins sets limits to the size of vessels that call at the port of Luanda and Lobito. To accommodate larger vessels and to reduce costs, these two ports would need to be deepened. However, the construction of the quay wall poses a technical challenge to a deepening of the port basin at the port of Luanda. The lack of public funds constrains investment in port development in Angola, including a deepening of ports.

Interviewees state that high import time at the port of Luanda results from a lack of storage capacity. The lack of storage capacity is traced back to the fact that ports in

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86   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-30-05	AO-30-09	AO-32-10	AO-34-06	AO-35-06	AO-36-13
AO-42-01	AO-42-05	AO-42-08	AO-42-14	AO-42-19	

Angola were mainly designed for exports. Today, contrary to their initial design as export ports, ports in Angola are, however, almost exclusively used for imports.

The port of Luanda is in need of increases in capacity. The number of berths needs to be increased, the water depth needs to be deepened and the storage capacity needs to be increased. Although plans to expand the port of Luanda exist, no actions have been taken yet.

The performance of port cranes is low at all main ports of the country, i.e. Luanda, Lobito, Cabinda, and Namibe. The low port crane performance increases the vessel and cargo handling time and, eventually, increases port costs and charges.

The port infrastructure of the port of Cabinda makes port operations susceptible to weather conditions. Ongoing investments in port infrastructure are expected to reduce weather susceptibility and to allow for significant increases in port handling volumes.

The need to import most goods and services to Angola sometimes leads to a lack of specific goods and services in Angola. This applies to port equipment as well and leads to breakdowns of port handling equipment. Currently, there is a lack of spare parts at the port of Lobito. Due to the breakdown of cranes at the port of Lobito, the port is currently only able to handle vessels with their own cranes. Vessels with cranes are, however, not the usual case. This affects port as well as supply chain performance.

Port management and organisation

This section presents the core statements on port management and organisation.[87]

Insufficient performance of the port of Luanda is also attributed to deficiencies in the management and organisational structure. The port of Luanda is split up into sectors, which are run by different port companies. This sectoral splitting prevents a coherent organisation of port operations as well as overall optimisation of port performance.

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87   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-36-08	AO-36-09	AO-36-12	AO-36-15	AO-36-16	AO-36-17
AO-36-18	AO-36-19	AO-36-23	AO-42-02	AO-42-03	AO-42-06
AO-42-09	AO-42-16				

The sectors and different terminal operators do not face much public control and companies are able to ignore public regulations. For instance, in the past a terminal operator was able to import much higher quantities of goods than actually declared. This is at the detriment of the local manufacturing and local trade industry and sustainably impedes improvements in supply chain performance in Angola.

Interviewees point out that despite geographical proximity, a similar geographical size as well as geographical structure, the port of Luanda and port of Lobito perform very differently. Whilst the performance of the port of Luanda is low, the performance of the port of Lobito is high. Whilst performance varies significantly from terminal to terminal at the port of Luanda, the performance is high at the port of Lobito, irrespective of the specific terminal. Interviewees attribute differences in performance between the two ports to differences in organisational structures, differences in the degree of public control as well as differences in structures and attitudes of the local population and workforce: A highly split up organisational structure and insufficient degree of public control leads to insufficiently organised operations at the port of Luanda. A simple organisational structure and an adequate degree of public control ensure well-organised operations at the port of Lobito. A diverse structure of the population that places much value on pursuing personal interests impairs the performance of the port of Luanda. Differences in attitude among population groups are traced back to the former colonial system, which caused an isolation among population groups and fostered tribal behaviour. A more homogenous structure of the population that places much value on pursuing socially reputed interests allows supporting the performance of the port of Lobito. Albeit dating back more than four decades, past events still seem to have an influence on the attitude and behaviour of today's workforce.

Since a private terminal operator operates the port of Namibe, vessel waiting time, vessel loading and unloading as well as yard handling operations have significantly been improved. The Sogester terminals at the port of Luanda and the port of Namibe show that the right investment and knowledge can lead to major improvements in port performance. The good performance of the Sogester terminal is attributed to the following reasons: First, the terminal operator provides the necessary know-how in port operations and management. Second, the operator provides the necessary infra- and suprastructure and makes sure that the infrastructure is publicly provided. Third, the operator is familiar with the challenging business environment in Angola.

Interviewees state that in the recent past, there was an incident of undue governmental interference in port operations. The government opposed international trading and import procedures that were intended to protect shippers and exporters. Undue governmental interference in port operations, however, deteriorates the credibility of trading and doing business in Angola. Like in other industries in Angola, in port business there is strong governmental interference. Business operations of private companies need to be in line with governmental intentions. That sometimes impedes port operations and in the long run may deteriorate port performance.

Interviewees suggest a number of actions for improvement at the port of Luanda. First, instead of a splitting into port sectors, the port of Luanda should be run as a single area of control and by a single port company. Ports should be run under a different management model. Second, terminal and port operations should be more tightly controlled by public authorities. Public authorities should ensure that port operations comply with public trade regulations in Angola.

Examples of well-organised and well performing ports exist around the world, for instance at the port of Hamburg. However, despite good examples, evidence shows that individuals and the public sector in Angola were able to transform a major public company into an intransparent organisation that allows individuals to take advantage at the detriment of the public. Consequently, the past has shown that private interests may interfere with public objectives at the expense of the port performance and, thus, may represent an obstacle to improvements in supply chain performance in Angola.

Education and workforce

This section presents the core statements on education and workforce.[88]

The supply of skilled labour does not meet the demand of the port industry in Angola. Because of higher paying conditions in the oil and gas industry, skilled labour is often attracted by the oil and gas industry. To get the necessary skills to operate ports in Angola, companies often do not hire new employees based on existing qualifications, but rather on their potential to develop and meet the requirements in the future.

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88   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-42-10						

Because deficiencies in education and workforce do not only affect the port industry but the other supply chain domains as well, a comprehensive analysis of deficiencies in education and workforce follows in section 6.3.1.5 on the supply chain system of Angola.

Hinterland transport

This section presents the core statements on hinterland transport.[89]

The state of infrastructure of access roads is poor at the port of Luanda. The poor condition of access roads contributes to congestion of the immediate port hinterland. The poor state of the road infrastructure and resulting congestion impede transport between the port of Luanda and nearby dry ports. This is particularly pronounced during rainy season, when the access roads get flooded and intensify congestion. The volume of cargo and traffic exceeds the capacity of the road transport system around the port. A reduction or even elimination of congestion would improve the inbound and outbound road transport of the port and could lead to significant reductions in time. The immediate hinterland access needs to improve.

Due to the lack of an adequate road and rail transport system to neighbouring countries, Angola is currently not an alternative export route.

Since the war, for a long time, road transport was the only option for port hinterland transport. It was only recently that the railway from the port of Luanda to the hinterland was put into operation again. Before the recommissioning of the railway, freight volumes on the road were even higher. Despite a rail terminal at the port of Luanda, rail hinterland transport volume is low.

Some interviewees state that in the past there was a railway line between Lobito and Zambia. At the moment, it is, however, unknown whether this line is only for passengers or also for containers. This railway line could be used to export copper from Zambia and wood from Angola via the port of Lobito. However, first of all, there is a need for export licences. Other interviewees state that the railway link between An-

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89   Reference table to the appendix publication, as explained in footnote 83 on page 146.

SA-06-04	SA-35-02	AO-01-03	AO-29-16	AO-32-11	AO-33-09
AO-35-03	AO-36-14	AO-36-20	AO-42-07	AO-42-15	AO-42-17
AO-42-20					

gola and the DR Congo has not been completed yet. Only once the railway line between the port of Lobito and the DR Congo is in operation, can the new bulk terminal at the port of Lobito be run at full capacity. Currently, a lack of a cross-border rail link constrains the performance of the port of Lobito.

As was pointed out earlier, it is often not an insufficient port performance that constrains supply chain performance in southern African countries, but rather an insufficient link between the ports and their hinterland transport systems. This applies to Angola as well. Deficiencies in the interface between ports as well as road and rail transport impede supply chain performance.

Because of significant deficiencies in hinterland transport, such as road transport, and at the same time high potential of hinterland transport, improvements in hinterland transport provide the greatest opportunities to improvements in supply chain performance. Once new ports and railways, such as the Benguela railway, are up and running in Angola, they will provide alternatives and competitors to established transport corridors to landlocked countries through southern Africa.

Cross-cutting issues

This section presents the core statements on cross-cutting issues.[90]

Because of the high share of cargo that enters the country through its ports, the ports play a crucial role in supplying the economy of Angola with goods.

There are plans to construct a new port at Barra do Dande. This new port project provides the opportunity to learn from and avoid deficiencies like at the port of Luanda, such as an inadequate port infrastructure, an inadequate hinterland access as well as a deficient management and organisational model. Once this new port is up and running, it will provide an alternative to and put pressure on the port of Luanda.

Because the right investment and know how can lead to significant improvements in port performance, the existing know-how should be transferred from well performing terminals or ports to other ports in Angola.

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90   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-30-09	AO-32-05	AO-36-12	AO-36-21	AO-36-22	AO-42-04
AO-42-16					

The operation of ports is the responsibility of the public and private sector. Ports should be run under public-private partnership. Other interviewees oppose this, because of the risk of short-term-oriented utilisation of port infrastructure and equipment as well as resulting long-term deterioration of port performance. The provision and operation of capital-intensive infrastructure, such as port infrastructure, is a public responsibility. The reconstruction and development of ports is the responsibility of the public sector. Yet other interviewees state that the provision of port infrastructure is the responsibility of the public sector.

The lack of public funds represents an obstacle to a continuation of reconstruction and development of ports in Angola. The scarcity of funds impedes the redevelopment of the port of Lobito.

Importance and performance of seaport attributes

Figure 6-7 illustrates the average relative importance values[91] of seaport attributes across countries as well as the average performance values[92] of these attributes in Angola. To recap, 18 respondents evaluated the importance of seaport attributes. Eight respondents rated the performance of seaport attributes in Angola. Due to the low number of respondents, the questionnaire and the personal interview results should be analysed coherently in order to provide a meaningful picture.

To give an overview, respondents assigned a fair to poor rating to the port performance in Angola.[93] Whilst respondents assigned a fair to poor performance rating to landward accessibility, public policies and services as well as infrastructure, respondents assigned a good to fair performance rating to operations as well as seaward

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91   For ease of interpretation and analysis, the average relative importance values have been translated into verbal expressions, by means of the following scheme: standard deviation (σ) = 9.1 %; mean (μ) = 20 %; μ - 1σ = 10.9 %; μ + 1σ = 29.1 %

      μ + 1σ <   x   ≤   100 %   High
      μ <   x   ≤ μ + 1σ Medium to high
      μ - 1σ ≤   x   < μ Medium to low
      0 %   ≤   x   < μ - 1σ Low

92   For ease of interpretation and analysis, the average degree of agreement values have been translated into verbal expressions, by means of the following scheme:

      1.0 – 2.4   Strong agreement   Good
      2.5 – 3.4   Slight agreement   Good to fair
      3.5 – 4.4   Slight disagreement   Fair to poor
      4.5 – 6.0   Strong disagreement   Poor

93   The mean value and standard deviation across all five attributes of port performance in Angola is 3.6 and 0.6, respectively.

accessibility – in ascending order. With this overview in mind, this section now presents the details by attribute.

Figure 6-7: Importance and Performance – Seaports Angola
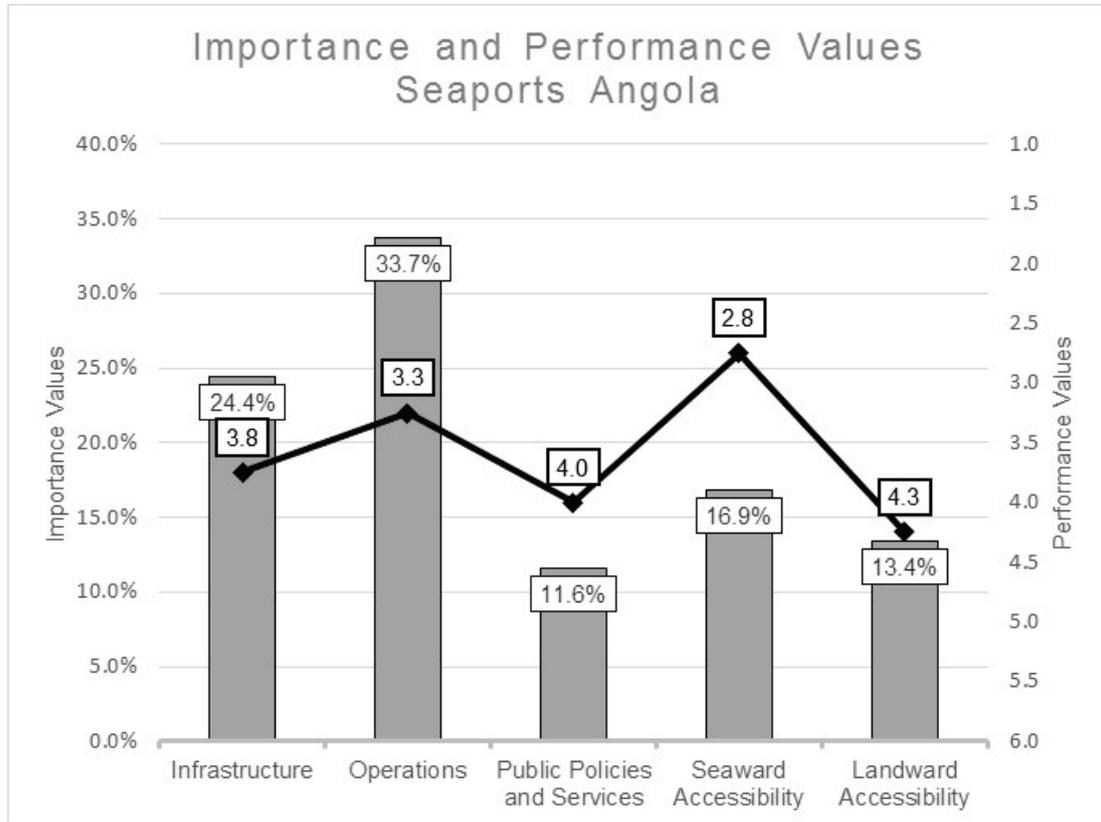
An essential aspect to consider before contrasting importance and performance values is the procedure that is applied here to identify constraints of port performance.

First, as already contemplated earlier in the research design, attributes need to perform according to their importance to the supply chain domain performance. Whilst those attributes, which are of high importance to the supply chain domain performance need to provide a high performance, those attributes which are of low importance to the supply chain domain performance only need to provide a low performance. For the time being, this view is accepted to be the prevailing mechanism of constraining factors; supplementary considerations are taken into account a little later. The attribute importance is regarded as the independent factor that sets the direction for the attribute performance. Whilst underperformance points to constraints, overperformance points to valueless excess attribute performance. This would mean that importance and performance values are treated with equal weight in the decision on

their effect. This "equal weight" procedure makes allowance to complete compensatory interaction effects among attributes; each attribute is treated in an isolated manner. This procedure yields the following picture and leads to the following conclusions:

Respondents assigned a medium to high importance (24.4 %) as well as a fair to poor performance rating (3.8) to infrastructure. The medium to high importance argues for a higher than fair to poor performance. Thus, the infrastructure seems to represent a constraint to port performance in Angola.

Respondents assigned a high importance (33.7 %) as well as a good to fair performance rating (3.3) to operations. The high importance argues for a higher than good to fair performance. Thus, the operations seem to represent a constraint to port performance in Angola.

Respondents assigned a medium to low importance (11.6 %) as well as a fair to poor performance rating (4.0) to public policies and services. The medium to low importance justifies a fair to poor performance. Thus, public policies and services do not seem to represent a constraint to port performance in Angola.

Respondents assigned a medium to low importance (16.9 %) as well as good to fair performance rating (2.8) to seaward accessibility. The medium to low importance would justify a slightly lower than good to fair performance. Thus, seaward accessibility does not seem to represent a constraint to port performance in Angola.

Respondents assigned a medium to low importance (13.4 %) as well as fair to poor performance rating (4.3) to landward accessibility. The medium to low importance justifies a fair to poor performance. Thus, landward accessibility does not seem to represent a constraint to port performance in Angola.

Second, based thereon, an additional consideration should come into play: Provided that an attribute is important, irrespective of the actual level of importance, the attribute needs to provide a relative minimum level of performance in order to allow other attributes to unfold their full performance potential. Irrespective of the actual level of importance, attributes, which provide the lowest performance, represent constraints to supply chain domain performance. This would mean that a much higher than equal weight is given to the performance component of the lowest performing attributes. This "higher weight towards lowest performance" procedure makes allowance to compensatory and non-compensatory interaction effects among attributes. Each attribute performance value is treated amid the other attribute performance values.

This procedure yields the following picture and leads to the following conclusions: Landward accessibility received the lowest performance value. Thus, the landward accessibility seems to represent a constraint to seaport performance in Angola.

Consequently, all in all, infrastructure, operations as well as landward accessibility seem to represent constraints to port performance in Angola. The limited database does not allow for further differentiation. Additional sources of information will allow for further differentiation at a later stage.

6.3.1.2 Road Transport

The core statements on road transport networks are sorted according to the following sections, namely, road transport performance, road infrastructure, cross-border transport, transport regulation as well as overarching statements. The presentation of statements in categories is followed by the presentation and interpretation of combined importance and performance values of road transport attributes.

Road transport performance

This section presents the core statements on road transport performance.[94]

The insufficient road transport performance impedes domestic transport in Angola. However, because of the lack of an adequate rail transport system, road transport is the main mode of transport in Angola. Most freight is transported on roads in Angola.

Because of the lack of an adequate road transport system, Angola does not represent an alternative export transport corridor anymore.

In the Luanda province, road transport performance is fair.

Road infrastructure

This section presents the core statements on road infrastructure.[95]

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94   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| AO-01-03 | AO-06-01 | AO-32-17 | AO-33-13 | AO-34-09 | AO-36-34 |

95   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-01-02	AO-01-03	AO-02-01	AO-06-01	AO-21-01	AO-29-18
AO-29-21	AO-30-05	AO-30-11	AO-30-12	AO-30-18	AO-32-15
AO-32-16	AO-33-09	AO-35-08	AO-35-09	AO-36-04	AO-36-24

Since the colonial period, road infrastructure in Angola mainly stretches from the ports to the hinterland. A road network that links economic centres in the hinterland of Angola does not exist. Prior to the war, the state of the existing road infrastructure was good in Angola. During the war, however, the road infrastructure was destroyed.

Because of the spread of land mines on strategically important roads, there was a need to demine the road infrastructure before reconstruction measures could start. It took about about eight years until the reconstruction of the road infrastructure could start. Since the end of the war, the road infrastructure has been reconstructed and is still being reconstructed. Since then, the state of the road infrastructure has been improved. Apart from the section between Soyo and Luanda, the primary road infrastructure has been reconstructed. The road infrastructure from the port of Cabinda to the DR Congo has been newly constructed. Today, the state of the road infrastructure that connects the port of Cabinda and the DR Congo is good. The road infrastructure that connects the port of Luanda and the port of Lobito is poor. The state of secondary and tertiary road infrastructure is still poor. Other interviewees state that all in all road infrastructure is poor in Angola. The state of the road infrastructure decreases from the west to the east. Because of the poor state of the road infrastructure, airfreight is an important mode of transport in Angola.

On cross-border routes, the state of the road infrastructure is poor. The existing road infrastructure is insufficient to bear heavy loads, such as mineral export freight. Because of the poor state of the infrastructure, ports and road transport routes through Angola do not provide an alternative export transport corridor for neighbouring countries anymore.

The poor state of the road transport infrastructure causes frequent vehicle breakdowns and thereby increases the costs of road transport in Angola. In addition, high transport distances and significant variances in altitude in Angola make road transport even more difficult and costly. The costs of road transport are high in Angola and impede the use of road transport. The costs of road transport from Luanda to Lobito are similar to ocean freight rates between Germany or Portugal and Angola.

After the reconstruction of the road infrastrucure, the road infrastructure now needs to be maintained adequately. However, since reconstruction, the road infrastructure

AO-36-25	AO-36-34	AO-42-20			

has deteriorated again. An insufficient quality of construction material for maintenance as well as the high need for maintenance contributes to the fast deterioration. During rainy season, roads get flooded which contributes to faster deterioration of the infrastructure. The mountainous terrain places high requirements on road infrastructure maintenance. Road infrastructure maintenance measures are not sustainable. Despite reconstruction, the road infrastructure is still in need for reconstruction. The lack of public funds hinders an adequate investment in the maintenance of road infrastructure in Angola.

In addition to maintenance, the road network needs to be expanded.

During rainy season, weather conditions affect road transport performance. Road transport needs to be independent from weather conditions. To ensure more reliable road transport operations, ferries need to be replaced by bridges.

Accident rates on roads in Angola are high. Accidents usually directly affect and impede road transport performance.

To maintain and develop the road transport infrastructure, interviewees suggest awarding licences, which allow companies to collect toll charges and oblige them to maintain the infrastructure. Similarly, to finance maintenance measures, other interviewees suggest implementing toll charges in Angola. These measures should have been taken years ago.

Whilst the arrangement of maintenance measures is a public sector responsibility, the execution of maintenance measures is a private sector responsibility.

Because of the high importance of road transport in port hinterland transport in Angola and the general poor to fair state of road transport infrastructure, improvements in road transport infrastructure should be of primary importance.

Cross-border transport

This section presents the core statements on cross-border transport.[96]

Due to the poor state of the road infrastructure, cross-border transport routes do not provide an alternative to export corridors through eastern or southern Africa. Cross-

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96   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| AO-01-03 | AO-29-17 | AO-29-18 | AO-29-19 | AO-29-20 | AO-35-10 |

border transport volume between Angola and neighbouring countries is low. However, the proximity of ports in Angola to neighbouring and landlocked countries, such as the DR Congo and Zambia, speaks in favour of establishing cross-border transport corridors between Angola and neighbouring countries. The private sector in Angola would be interested in the corridor business. The market potential is, however, unknown. Up to now, the public sector has not paid much attention to strengthening corridor business to neighbouring countries. Because the market potential is unknown, first of all, the private sector would need to clarify the market potential of cross-border corridors.

Like at sea-land borders, customs clearing offices do not operate at the weekend. Thus, non-cleared goods cannot cross the border and need to wait for working days. This increases the time to cross borders and increases cross-border transport time. The government is responsible for provoking an extension of customs operating hours.

Currently, there is a need to rewrite import and export documents at border crossings. There are plans to implement a new customs IT system that would set document standards across countries and thereby improve cross-border transport.

The government is responsible for provoking improvements in customs operations.

The need to provide additional, informal payments to cross borders increases the costs of cross-border road transport.

An insufficient security situation, i.e. cargo theft and hijacking of vehicles, in the east of the country constrains cross-border road transport.

Transport regulation

This section presents the core statements on transport regulation.[97]

Apart from bridges, load regulation of road infrastructure still does not exist in Angola. Because of the lack of vehicle load regulation and control, vehicle loads often exceed the bearing capacity of the road infrastructure. Overloading accelerates the deterioration of road infrastructure and vehicles.

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97   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-33-10	AO-33-11	AO-36-25			

In order to limit the load on road infrastructure, public regulation on load limitation as well as weighbridges for law enforcement are necessary. In contrast to Angola, other countries in southern Africa, such as Namibia, have had load regulations in place for a long time.

Improvements in vehicle load regulation or road usage charges are unlikely to be realised in the near to medium future.

Importance and performance of road transport network attributes

Figure 6-8 illustrates the average relative importance values[98] of road transport network attributes across countries as well as the average performance values[99] of these attributes in Angola. To recap, 16 respondents evaluated the importance of road transport network attributes. Only a single respondent decided to rate the performance of road transport network attributes in Angola. Due to the low number of respondents, the questionnaire and the personal interview results should be analysed coherently in order to provide a meaningful picture.

To give an overview, the respondent assigned a good to fair rating to the road transport performance in Angola.[100] The respondent assigned a poor rating to transhipment centres, a fair to poor rating to public policies and services as well as infrastructure, as well as a good performance rating to transport operations and equipment and facilities – in ascending order. With this overview in mind, this section now presents the details by attribute.

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98   For ease of interpretation and analysis, the average relative importance values have been translated into verbal expressions, by means of the following scheme: standard deviation (σ) = 11.8 %; mean (μ) = 20 %; μ - 1σ = 8.2 %; μ + 1σ = 31.8 %

$\mu + 1\sigma$	<	x	≤	100 %
μ		< x	≤	$\mu + 1\sigma$
$\mu - 1\sigma$	≤	x	<	μ
0 %	≤	x	<	$\mu - 1\sigma$

$\mu + 1\sigma$ < x ≤ 100 %   High
μ < x ≤ $\mu + 1\sigma$ Medium to high
$\mu - 1\sigma$ ≤ x < μ Medium to low
0 %   ≤ x < $\mu - 1\sigma$ Low

99   For ease of interpretation and analysis, the average degree of agreement values have been translated into verbal expressions, by means of the following scheme:
1.0 – 2.4   Strong agreement   Good
2.5 – 3.4   Slight agreement   Good to fair
3.5 – 4.4   Slight disagreement   Fair to poor
4.5 – 6.0   Strong disagreement   Poor

100   The mean value and standard deviation across all five attributes of road transport performance in Angola is 3.2 and 1.6, respectively.

Figure 6-8: Importance and Performance – Road Transport Angola
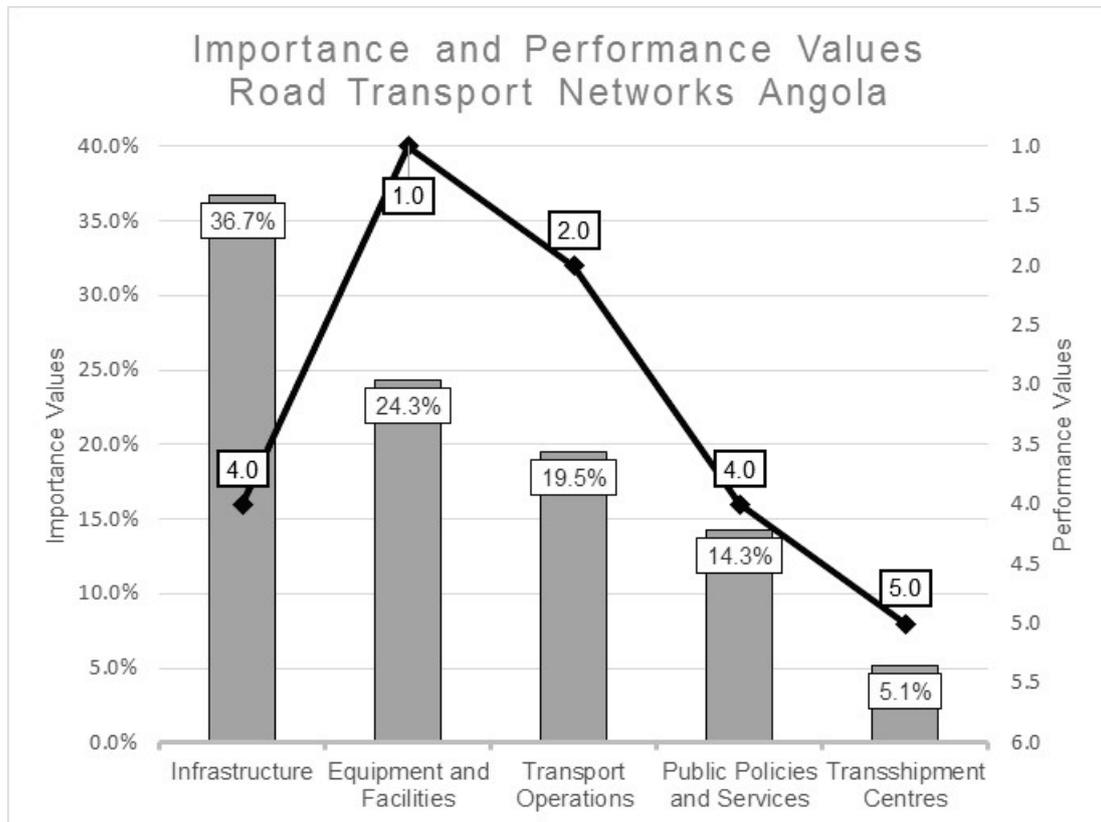
First, the "equal weight" procedure is applied. This procedure yields the following pic-ture and leads to the following conclusions.[101]

Respondents assigned a high importance (36.7 %) as well as fair to poor performance rating (4.0) to infrastructure. The high importance argues for a much higher than fair to poor performance. Thus, the infrastructure seems to represent a constraint to road transport performance in Angola.

Respondents assigned a medium to high importance (24.3 %) as well as good per-formance (1.0) to equipment and facilities. The medium to high importance would even justify a lower than high performance. Thus, equipment and facilities do not seem to represent a constraint to road transport performance in Angola.

Respondents assigned a medium to low importance (19.5 %) as well as good perfor-mance rating (2.0) to transport operations. Although close to the upper threshold, the medium to low importance value would even justify a lower than good performance.

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101   The "equal weight" procedure gives an equal weight to the importance and perfor-mance component, as described in section 6.3.1.1 on page 158.

Thus, transport operations do not seem to represent a constraint to road transport performance in Angola.

Respondents assigned a medium to low importance (14.3 %) as well as a fair to poor performance rating (4.0) to public policies and services. The medium to low importance justifies a fair to poor performance. Thus, public policies and services do not seem to represent a constraint to road transport performance.

Respondents assigned a low importance (5.1 %) as well as a poor performance rating (5.0) to transhipment centres. The low importance justifies a poor performance. Thus, transhipment centres do not seem to represent a constraint to road transport performance in Angola.

Second, the "higher weight towards performance" procedure is applied.[102] This procedure yields the following picture and leads to the following conclusions: Transhipment centres received the lowest performance value. Thus, transhipment centres seem to represent a constraint to road transport performance in Angola.

Consequently, all in all, the infrastructure and transhipment centres seem to represent constraints to road transport performance in Angola. The limited database does not allow for further differentiation. Additional sources of information will allow for a further differentiation at a later stage.

6.3.1.3 Rail Transport

The core statements on rail transport networks are sorted according to the following sections, namely, rail transport performance, rail infrastructure, transport operations, cross-border transport, ownership and management as well as cross-cutting issues. Because none of the respondents decided to complete the questionnaire on rail transport performance of Angola, combined importance and performance attribute values of rail transport performance in Angola cannot be presented.

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102   To recall, provided that an attribute is important, irrespective of the actual level of importance, the "higher weight towards performance" procedure gives a higher weight to the performance component, as described in section 6.3.1.1 on page 159.

Rail transport performance

This section presents the core statements on rail transport performance.[103]

Prior to the war, rail transport was competitive and an alternative mode of transport in Angola. During the war, the rail transport system was destroyed. Since then, rail transport does not provide an alternative mode of transport to the Angolan hinterland and hinterland countries anymore. Because of the lack of an adequate rail transport system, Angola does not represent an alternative export transport corridor anymore. In the meantime, other transport corridors emerged and have been established.

Some interviewees state that rail freight transport is not available in Angola. Other interviewees state that not much freight is carried on railways in Angola. It was only recently that the Luanda railway was put into operation again.

The lack of adequate rail transport performance impedes the distribution of goods in Angola. Because most agricultural land is located outside of economic centres, an adequate rail transport system would facilitate distribution and foster production of agricultural products.

Often, in southern Africa, the rail transport performance is not sufficient to provide the necessary service level or allow for transport at allowable costs. This applies to Angola as well.

Rail infrastructure

This section presents the core statements on rail infrastructure.[104]

During the colonial period, railways in Angola were designed to transport agricultural and mining goods from the sources in the hinterland to the ports of Luanda, Amboim, Lobito and Namibe. The aim was to carry goods immediately from the source to the ports for export. It was not the aim to provide the country with an expansive transport

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103   Reference table to the appendix publication, as explained in footnote 83 on page 146.

SA-35-02	AO-01-03	AO-01-04	AO-29-21	AO-30-13	AO-32-17
AO-33-13	AO-36-14	AO-36-34			

104   Reference table to the appendix publication, as explained in footnote 83 on page 146.

SA-06-04	AO-01-02	AO-01-03	AO-01-04	AO-06-01	AO-06-02
AO-29-21	AO-30-12	AO-30-13	AO-32-18	AO-33-12	AO-35-11
AO-35-12	AO-36-14	AO-36-26	AO-36-28	AO-36-30	AO-36-31
AO-36-34	AO-42-17	NA-18-14			

network in order to connect economic centres in Angola. Four separate railways exist. These four lines cross the country from the west to the east, but vertical links do not exist. A railway from Luanda to the south of Angola does not exist. A rail transport network does not exist in Angola.

During the war, the rail transport infrastructure was destroyed. Because of the lack of an adequate rail transport system from Angola to neighbouring and landlocked countries and in spite of higher distances as well as the need to change traction units, in the meantime alternative cross-border transport options through eastern and southern Africa have been established.

Because of the spread of land mines on strategically important routes, there was a need to demine the rail infrastructure before reconstruction measures could start. It took about eight years until the reconstruction of the rail infrastructure could start.

Recently, the railway from the port of Luanda, the Caminho de Ferro de Luanda, was recommissioned. Other interviewees state that there are plans to redevelop the railway from the port of Luanda to Malanje; the feasibility study has not been completed yet.

The railway from the port of Lobito to neigbouring DR Congo and Zambia, the Caminho de Ferro de Benguela, is being redeveloped. Other interviewees state that prior to the outbreak of the economic recession, the Benguela railway was redeveloped. It still lacks a cross-border link to the DR Congo, on the Congolease side. Yet other interviewees state that, at the moment, the Benguela railway line is in operation; however, it can only be used for passenger not for freight transport. The Benguela railway is expected to trigger transport and trade between the port of Lobito and Zambia.

Currently, the government is reconstructing the railway from the port of Namibe to the Angolan hinterland, the Caminho de Ferro de Moçâmedes. This line is only in operation between Namibe and Matala; the section between Matala and Menongue is being reconstructed. However, land mines impede the reconstruction. There are plans to extend this existing railway to neighbouring countries. The extension to Mozambique, Namibia and South Africa is however unlikely because wetlands would make it difficult to maintain the rail infrastructure. Nonetheless, since the potential freight volume of neighbouring countries would justify a railway to the hinterland, plans of neighbouring countries, such as Namibia, to extend their railways to Zambia, are economically reasonable.

Different from the other railways, the railway at the Port Amboim, the Caminho de Ferro do Amboim, has a narrow gauge size.

In the 1960s, the rail transport system in Angola was analysed and a concept to link the three main railways with the railways of neighbouring countries was elaborated. At the end of the war, the government adopted these plans to reconstruct and develop the rail transport system and started to put these plans into action according to economic relevance. Since 2001, plans to set up transhipment centres along the railways to incentivise agricultural production exist. However, priority of public investments has been given to the oil sector.

Once new ports and railways, for instance on the Lobito Corridor, are up and running in Angola, they will provide alternatives and represent competitors to established transport corridors for landlocked countries through southern Africa again. Some interviewees state that before Angola plans to unlock freight volume of its neighbouring countries, first, it should ensure that the railway system allows for domestic transport in Angola. Similarly, before extending the railways to neighbouring countries, the railway system should be used to transport Angolan export commodities.

Transport operations

This section presents the core statements on transport operations.[105]

None of the railways is frequently served.

The relaunch of rail transport in Angola is not just a matter of reconstructing the rail transport infrastructure, but also of re-establishing well working transport operations. Only if both infrastructure and operations provide a consistent service, will companies start using rail transport again. The re-establishing of well working transport operations will take at least five years.

A relaunch of a rail transport system with a sufficient performance is expected to facilitate freight transport and, by doing so, fostering agricultural production in Angola. There is a need for frequent rail transport services and a need for refrigerated waggons.

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105   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| AO-06-02 | AO-33-12 | AO-33-13 | AO-36-34 | | |

It is right to invest in the rail transport system. However, in order to bring companies to use rail transport, rail transport operations need to be improved and need to be efficient as well.

Cross-border transport

This section presents the core statements on cross-border rail transport.[106]

As pointed out with regard to port hinterland transport, some interviewees state that it is unknown whether the Benguela railway line between Lobito, the DR Congo and Zambia is in operation. Other interviewees state that this line is in operation up to the border of the DR Congo, but it still lacks a cross-border link on the Congolease side. This railway line could be used to export copper from Zambia and wood from Angola via the port of Lobito. Due to the lack of an adequate rail transport sytem to neighbouring countries, currently, Angola is not an alternative export route.

Other interviewees point out that the relaunch of the Benguela railway not only entails the reconstruction of rail infrastructure but also the implementation of smooth railway operations. This will take at least five years. However, once operational again, the Lobito railway corridor will represent an alternative and threaten transport routes via South Africa. It is expected that the relaunch of the Benguela railway line will trigger transport between the port of Lobito and the hinterland of Angola as well as Zambia.

Ownership and management

This section presents the core statements on ownership and management.[107]

Interviewees criticise the allocation of control of the rail infrastructure and the rail operations to the ministry of transport and ministry of economy, respectively. The separation of responsibility only serves to create intransparency and impedes rail transport performance. Instead of a separation, a single organisation should be in charge of the rail transport system.

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106   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-01-03	AO-06-02	AO-42-17			

107   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-29-22	AO-32-05	AO-33-14	AO-33-15	AO-36-04	AO-36-21
AO-36-22	AO-36-29	AO-36-32			

Some interviewees state that a privatisation of the rail transport system would probably be the best solution to ensure that rail transport becomes a well performing and important mode of transport in Angola. The operation of railways is the responsibility of the public and private sector. The public sector should enter into a public-private partnership to run the rail transport system. There are plans for private sector participation in the rail transport system. These plans have, however, not materialised yet. Significant investments are necessary to operate the rail transport system. Because the private sector cannot or is not willing to bear the risk of such a long-term investment, the public ownership and operation remains the only option. Yet other interviewees state that the provision of the rail infrastructure is the responsibility of the public sector. Because of the risk of short-term-oriented utilisation of infrastructure and equipment and resulting long-term deterioration of rail transport performance, the provision and operation of capital-intensive rail infrastructure is a public responsibility. The recovery and development of the rail transport system is the responsibility of the public sector.

The public sector is responsible for bringing the private sector to use rail transport in Angola. The provision of transhipment centres is the responsibility of the public sector.

To maintain and develop the rail transport infrastructure some interviewees suggest awarding licences, which allow companies to collect track access charges and oblige them to maintain the infrastructure. These measures should have been taken years ago.

Cross-cutting issues

This section presents the core statements on cross-cutting factors.[108]

Since the outbreak of the economic recession, the scarcity of public funds and foreign exchange impedes investments in recovery and development of the rail transport system in Angola.

6.3.1.4   Manufacturing Locations

The core statements on manufacturing locations are sorted according to the following sections, namely, agricultural production, industrial production, domestic market size,

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108   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-36-04						

education and workforce, transport system, public regulation, supply of input goods as well as cross-cutting issues. Because none of the respondents decided to complete the questionnaire on manufacturing location performance of Angola, combined importance and performance attribute values of manufacturing location performance cannot be presented.

Agricultural production

This section presents the core statements on agricultural production.[109]

Prior to the war, the country had a large agricultural industry as well as produced and exported a variety of agricultural products of high quality, such as sisal, coffee, cane and cotton – to name but a few. The war has, however, led to a collapse of the agricultural industry in Angola. Despite a high potential for agricultural production, the current production volume is low. The current export volume is low. It was only few years ago that agricultural production was resumed.

The potential for the production of a variety of agricultural products is high in Angola. Agricultural production in Angola is expected to get back to its former strength again. The country has the chance to become a major exporter of agricultural products again. Because of the former strength in agricultural production and high potential for agricultural production in Angola, agriculture is well suited to diversify the economic structure.

Despite the high potential for a revitalisation of agricultural production in Angola, a number of factors impede a recovery and development of agricultural production.

A high number of land mines is still spread on fertile land and prohibits agricultural production.

In order to strengthen agricultural production, interviewees suggest that the government should provide incentives for people to engage in agricultural production.

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109   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-01-05	AO-29-23	AO-29-24	AO-30-17	AO-33-17	AO-34-17
AO-36-35	AO-42-22				

Industrial production

This section presents the core statements on industrial production.[110]

In the past, the prolonged war prevented an industrial production industry in Angola from emergence. Industrial production is new to Angola. Even basic goods that could be produced in Angola are imported.

The production of goods other than oil should increase. The potential for industrial production exists in Angola. The oil and gas sector does not, however, provide many opportunities for extending the structure of the economy to other industries. The high reliance on oil production and export does not speak in favour of an extension of the structure of the economy. Some industrial production activities have been started. A portion of the goods that are currently produced and imported from South Africa could be produced in Angola as well. To reduce price surpluses from foreign inflation, basic goods, such as dairy, medicine, construction and clothing products, need to be produced in Angola. A potential for mineral-resource-based production exists. However, mineral goods should not be exported unprocessed but rather be processed in Angola. Export of goods other than oil should increase.

A number of factors need to be put in place to allow building up a manufacturing industry in Angola. Some interviewees state that because of the high number of constraints, the country cannot become a meaningful exporter within the near to medium future. Similarly, other interviewees state that the country does not have a tradition in industrial production and, hence, no foundation on which the country can elaborate. Even the most basic input that is necessary to establish a manufacturing industry needs to be built up from scratch.

Before building up a manufacturing industry, the agricultural industry should be revitalised. The re-strengthening of the agricultural industry is more important than establishing an industrial production industry in Angola.

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110   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-29-26	AO-30-14	AO-32-19	AO-33-16	AO-34-11	AO-34-13
AO-34-17	AO-34-17	AO-35-13	AO-35-15	AO-42-21	

Domestic market size

This section presents the core statements on domestic market size.[111]

In contrast to other countries with a high agricultural potential, such as Nigeria, the critical factors of large-scale agricultural production, such as a large population or the lack of wars and its consequences, did not exist in Angola.

Whilst some interviewees state that the domestic market of Angola is too small to justify local industrial production, other interviewees state that the domestic market is large enough. Those interviewees, who are concerned about the market size justifying local industrial production, suggest that a reduction of trade barriers to southern African countries would give Angola access to a sufficiently large market. The much larger domestic market of Ethiopia is a major contributor to manufacturing locations in Ethiopia.

Education and workforce

This section presents the core statements on education and workforce.[112]

Because of the loss in achievements and prolonged stillstand in agricultural production, there are concerns about the ability of the workforce to re-establish an agricultural industry in Angola. Since the war, the population does not have the necessary knowledge about production and trade of goods anymore. After many years of negligence, an established export routine at ports does not exist. The population is, however, willing to regain its former strength in agricultural production and export. People need to be equipped with the necessary trading and transport knowledge in order to produce and distribute agricultural products.

The scarcity of a skilled workforce impedes manufacturing operations in Angola. Before an industrial production industry can be established in Angola, the education of the workforce needs to be increased.

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111   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-29-23	AO-36-02				

112   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-32-13	AO-34-14	AO-34-17	AO-36-35	AO-42-21	

Because deficiencies in education and qualification do not only affect manufacturing locations but the other supply chain domains as well, a comprehensive analysis of deficiencies in education and workforce follows in section 6.3.1.5 on the supply chain system of Angola.

Transport system

This section presents the core statements on the transport system.[113]

Agricultural land is often located outside and far away from major economic centres, in remote locations. In order to market agricultural products, there is a need for an adequate transport system. Prior to the war, an adequate transport system allowed value creation even in remote locations. However, because the war has destroyed and impeded any development of the transport system, the state of the transport system does not allow for an adequate supply and distribution anymore. Since the necessary product quality for export cannot be assured during transport, such as in the case of coffee, production and export is impossible. The frequency and performance of transport to the ports is not sufficient. The costs of transport are high. Weather significantly affects road transport performance. The poor domestic transport system renders agricultural production in remote locations in Angola economically unfeasible. The lack of an adequate transport system impedes a re-strengthening of agriculture in Angola. The road transport system needs to be improved in order to allow country-wide transport. The reconstruction and development of railways will tap many areas with vast agricultural resources.

Only once basic requirements, such as an adequate transport system as well as electricity supply system are in place can agricultural products be exported again.

The lack of an adequate transport system impedes domestic transport and, thus, does not allow distributing products to domestic as well as foreign markets. An adequate logistics system would allow Angola to market locally produced goods and to strengthen its manufacturing industry.

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113   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-29-10	AO-29-25	AO-30-18	AO-35-14	AO-36-33	AO-36-34
AO-36-35	AO-42-23				

Because deficiencies in the transport system do not only affect manufacturing locations but the other supply chain domains as well, a comprehensive analysis of deficiencies in the transport system and its consequences follows in section 6.3.1.5 on the supply chain system of Angola.

Public regulation

This section presents the core statements on public regulation.[114]

To make companies want to invest in the country, it should provide a regulatory environment that facilitates doing business in Angola.

Seven years ago, the government started issuing and enforcing local content legislation for both the oil as well as non-oil sector. The government established industrial zones. With these actions, the government intends to help recovering and developing supply chains in Angola.

Because deficiencies in public regulation do not only affect manufacturing locations but the other supply chain domains as well, a comprehensive analysis of deficiencies in public regulation follows in section 6.3.1.5 on the supply chain system of Angola.

Supply of input goods

This section presents the core statements on the supply of input goods.[115]

Due to the lack of a local production industry, almost all goods, even most basic goods, have to be imported. The costs of import goods are high. The price level in Angola is too high to allow locally produced goods to be competitive in international markets.

In 2005, before the outbreak of the economic recession in Angola, almost every import good was available on the market. Since the outbreak of the economic recession at

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114   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-30-16	AO-33-18				

115   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-29-06	AO-29-11	AO-32-02	AO-34-10	AO-34-08	AO-34-11
AO-34-13	AO-36-01	AO-42-11	AO-42-12	AO-42-14	AO-42-21
AO-42-25					

the end of 2014, the low value of the local currency against major international currencies increases the costs of import goods even further. Since then, the demand significantly exceeds the supply of goods. The scarcity of funds and foreign exchange impedes the ability of public and private organisations to trade internationally and, thus, impedes their supply of import input goods.

Interviewees argue, it is particularly the low value of the local currency against major international currencies that brings local companies to look for local sources of supply. However, local suppliers either do not exist, suppliers face difficulties in supply of input goods as well, or suppliers do not meet requirements of potential customers. The dependency on imports and low value of the Kwanza impedes the goods supply of potential local suppliers as well. A lack of a skilled workforce and tradition in the production industry keeps potential suppliers from meeting the quality requirements. Difficulties in procurement as well as in meeting customer requirements do not allow for an emergence of a local supplier base. Even if companies have the necessary funds in local currency, the lack of sources of supply does not provide any solution but to import goods at high costs or accept shortages in supply of input goods.

Interviewees state that to ensure a sufficient supply of input goods, companies are planning to set up their own manufacturing locations in Angola. It is not a lack of market potential that impedes the emergence of local suppliers; rather difficulties in supply of input goods and the lack of a skilled workforce impede the emergence of local suppliers.

The difficulty to procure and replenish input materials keeps stock levels low. There is a lack of funds to finance import goods. For basic import goods, the government provides financing at preferred rates. For non-basic goods, only commercial banks provide financing at current market rates.

High import time at ports in Angola leads to high replenishment time of import input goods. At times when stock levels are low, like during the current economic recession, high import and high replenishment time put the operations of companies at risk.

The risk of a further reduction in the frequency of vessel sailing and port calls in Angola as well as a reduction in the number of direct sailings would increase procurement and replenishment time even further. In turn, this would increase the costs of import goods even further and place a burden on stock availability of companies.

Cross-cutting issues

This section presents the core statements on cross-cutting issues.[116]

In contrast to logistics operations such as ports and railways, the operation of manufacturing operations is at the full responsibility of the private sector.

6.3.1.5 Supply Chain System

The core statements on the supply chain system are sorted according to the following sections, namely, stage of development of the economy, structure and state of the economy, development of the economy, general economic infrastructure, public regulation, education and workforce as well as transport system.

Stage of development of the economy

This section presents the core statements on stage of development of the economy.[117]

Between 1975 and 2002, the war ground the development of the economy in Angola to a halt or even reversed it. The country was neither able to advance nor to maintain its stage of development of the economy. It is only since 2002 that the country is able to continue its path of development of the economy and supply chain system.

Since 2002, substantial improvements in the development of the economy have been achieved. Since then, most factors that determine supply chain performance have improved. Port, road transport, rail transport and manufacturing location performance as well as their supporting infrastructure have improved. The stage of development of the economy and supply chain system is, however, still low. Many projects are still at a feasibility stage and have not been realised yet. The country is still required continuing to recover, maintain and develop its economy and supply chain system.

Against the background of the growing demand of the population as well as the growing population, supply chains in Angola need to integrate tighter into cross-country supply chains. This requires that supply chains in Angola comply with the international

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116   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-32-05					

117   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-29-01	AO-29-09	AO-30-03	AO-30-04	AO-32-03	AO-33-11
AO-34-01	AO-35-01	AO-35-02	AO-36-05		

level of supply chain performance. To get there, it will however take at least 15 years. Despite a number of factors that constrain improvements in supply chain performance in Angola, a reasonable supply chain performance can be achieved in Angola.

Like in Angola, conflict or war has kept and still keeps many countries from advancing and even maintaining their stage of development of the economy. In contrast, other countries, such as South Africa, Namibia or Tanzania, did not have a war on their own territory and had the chance to continuously advance the stage of development of their economies. These countries have achieved a much higher stage of development of their their supply chain system.

Structure and state of the economy

This section presents the core statements on the structure and state of the economy.[118]

The war and high inflation destroyed assets and caused former business models to collapse as well as led to an economic concentration on oil production and exports. After the prolonged war, oil production and export remained the only meaningful industry in Angola. At that time, priority of investments and development was given to the oil sector. The economic concentration on oil production and export has, however, led to a high dependency of the economy on a single commodity and exposed the country to a considerable risk. The high reliance on a single commodity and absence of a local industrial production industry makes the country dependent on imports and represents a supply risk to organisations.

Interviewees remark that such a short-term view of developing the economy by governments cannot only be found in Angola, but in many other economies on the African continent as well.

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118   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-09-01	AO-29-01	AO-29-02	AO-29-06	AO-29-11	AO-29-12
AO-29-13	AO-32-01	AO-32-02	AO-32-04	AO-32-06	AO-32-07
AO-32-08	AO-32-19	AO-33-01	AO-33-16	AO-34-02	AO-34-08
AO-35-13	AO-35-17	AO-36-01	AO-36-04	AO-36-03	AO-36-04
AO-42-11					

Today, the situation of the economy of Angola hinges on the situation of the international oil price. Between 2005 and 2015, income from oil production and export flourished and the situation of the economy was good. The availability of public and private revenues ensured a sufficient supply of import goods. Almost every good was available on the market in Angola. In the third quarter of 2014, the negative side of the risk became effective and apparent. The oil price began to decline. The decline of the oil price caused the following effect: Lower demand for the local currency, the Angolan Kwanza, caused a significant devaluation of the Kwanza against major international currencies. The significant devaluation of the local currency vastly reduced the value of income in local currency in international trade and in foreign markets. In turn, the decay of the oil price reduced public and private income in Angola.

The lack of funds forced public and private investors to stop investments and thus to stop the recovery and development of the economy. The lack of funds caused shortages in supply of goods. In 2016, the surplus in public funds and foreign exchange was exhausted and the amount of funds and foreign exchange only sufficed to service public liabilities. The national bank started to manage foreign exchange. Since then, companies have struggled to get foreign exchange. The high dependency of the economy on income from oil and the decay of the oil price led to an economic recession.

It should be noted that on the one hand, the low value of the Angolan currency leads to high import costs; on the other hand, the low value makes exports from Angola less costly in other countries. Interviewees see an opportunity in the low value of the currency and exports. However, exports from Angola are low. For this reason, disadvantages in costs of imports are by no means compensated by advantages in foreign costs and export volumes.

Some interviewees state that the oil price will recover within the next two years. Once the oil price goes back to the level of 80 to 100 USD, the reconstruction and development projects will be resumed. Other interviewees state that because of the supply surplus with shale oil and the trend of shale oil to become less costly, the crude oil price will remain low. Yet other interviewees state that because of the large supply of oil and the high number of oil-exporting countries, a quick recovery of the oil price and revenues from oil business is unlikely. Hence, the economic situation in Angola will not change. The country has to look for alternative measures to fund its recovery and development. Yet other interviewees state that projections cannot be made.

The only chance for Angola to escape from the excessively high risk is to adapt to the changed market situation. The economic recession has created an awareness in the public and private sector that the sole reliance of the country on a single commodity and market exposes the country to an excessively high risk and is likely to lead the country into an economic recession again. The country needs to diversify its economy in order to sustainably continue recovering and developing the economy and supply chain system. The diversification of the economic structure is of utmost priority for the government of Angola.

Some interviewees state that the scarcity of funds and foreign exchange represents a major constraint to the recovery and development of the economy and supply chain system. Other interviewees state the scarcity of funds and foreign exchange is the largest or even the only constraint. The scarcity of funds and foreign exchange exerts a higher constraining effect than deficiencies in the freight transport system.

Development of the economy

This section presents the core statements on the development of the economy.[119]

The pace of doing business and the pace of development of the economy is low in Angola. There is a need for improving the pace of business and development of the economy.

Some interviewees state that the established political leadership is very powerful. Despite presidential elections in 2017, the elections will not change the established political leadership and, thus, will not bring major public action that could trigger improvements in the pace of doing business and development of the economy.

Other interviewees object that the government is busy recovering and developing the country and will continue to do so. Yet other interviewees state that the government is aware of the needs of companies and is willing to take actions to improve the performance of the economy. However, the lack of public funds does not allow the government to take actions. They expect that once the public income from oil business recovers, the government will continue reconstructing and developing the economy.

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119   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| AO-22-01 | AO-29-01 | AO-29-02 | AO-29-12 | AO-29-13 | AO-32-08 |
| AO-32-18 | AO-34-03 | AO-36-02 | AO-36-32 | | |

The scarcity and lack of funds represents the largest constraint to improvements of the economic and supply chain system.

Even though the government is said to have a large influence on the economy and decides on the pace of doing business and development of the economy, the low stage of development along with the recession since 2014 provides an explanation for the low pace of development of the economy and supply chain system as well.

Interviewees criticise that the population of Angola excessively relies on public actions. In contrast, in Kenya, the population is more entrepreneurial. Ethiopia has similar characteristics and faces similar constraints, although the domestic market of Ethiopia is much larger.

Some interviewees state that the slowness of doing business results from the lack of incentives to speed up processes or even incentives to restrain processes and incentives to speed up processes in exchange for additional informal benefits. This is motivated by the perception of the population that they are now, after the prolonged war and its consequences, entitled to participate in the economic opportunities and wealth of the economy. In addition, the low stage of development of the supply chain system is conducive to corrupt behaviour. It is recalled that some interviewees stated that corruption at customs is very low in Angola; other interviewees claimed the opposite.

In this regard, interviewees state that in port, rail transport as well as other industries such as agriculture, fishing and forestry, the structure of public organisations and management is designed to allow individuals to take advantage at the expense of the public objective of organisations. This may contribute to a sluggishness in recovery and development of the economy and supply chain system as well.

General economic infrastructure

This section presents the core statements on general economic infrastructure.[120]

The general infrastructure is insufficient.

The demand for electricity exceeds the supply of electricity and causes power cuts. During winter, supply and demand of electricity is in balance; during summer, an increased need for electricity causes power cuts. The costs of electricity are high. There

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120   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| AO-29-07 | AO-29-10 | AO-30-05 | AO-30-08 | AO-32-07 | AO-36-04 |

is a need of improvements in electrical infrastructure and in costs of electricity. There are projects underway to improve the supply of electricity. However, the lack of funds and foreign exchange represents an obstacle to improvements in electrical infrastructure.

If the revenues from oil business remain low, the public sector has to look for alternative ways to fund the general economic infrastructure of Angola.

In order to supply the economy adequately with electricity, interviewees suggest awarding licences, which allow companies to financially participate in electricity supply and oblige them to operate dams and hydroelectric power. These measures should have been taken years ago.

The telecommunications infrastructure is insufficient in Angola and needs to be improved. The airport infrastructure is insufficient in Angola and needs to be improved. Since an adequate general economic infrastructure provides the foundation for the economy to perform, a reconstruction and development of the general economic infrastructure is of major priority.

The scarcity of funds and foreign exchange impedes investments in the reconstruction and development of the general infrastructure.

Since the general infrastructure is being well developed in South Africa, the general infrastructure development in South Africa is a good example that Angola should look at and learn from.

Public regulation

This section presents the core statements on public regulation.[121]

The stage of development of the public regulatory system is still low in Angola and needs to be developed. In contrast, it is well developed in Namibia and South Africa.

A lack of public regulation of load limitations of vehicles contributes to a faster deterioration of road infrastructure and vehicles. High accident rates point to deficiencies in safety regulation and / or law enforcement. There is still a need for improvements in

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121   Reference table to the appendix publication, as explained in footnote 83 on page 146.

SA-04-01	AO-30-05	AO-30-07	AO-30-08	AO-33-10	AO-33-11
AO-33-18	AO-36-25	AO-42-02			

road transport regulation in Angola. Other countries in southern Africa, such as Namibia and South Africa are much more advanced.

The current set of public regulations impedes doing business, but should rather support private companies to do business in Angola. Public authorities should charge companies only once companies have created value. Interviewees state that dealing with taxes and contracts is not conducive to business in Angola. In order to make foreign companies want to invest, the government should provide a regulatory environment that is conducive to doing business in Angola.

Deficiencies in regulation do not stem from a lack of public regulations, but rather from the fact that during the war, people learned to circumvent formal institutions by means of informal, illegal institutions and these are still widespread among the people. The low stage of development of the supply chain system along with the short-term-oriented view and need to participate in economic wealth of the population provide a conducive environment for corruption.

In port operations, interviewees point out that there is need for higher public control of private port terminal operations in order to ensure that companies adhere to public regulations. The acceptance of circumvention of public regulations in ports by public authorities is at the expense of an emergence of a local production industry in Angola. Nonetheless, it should not be ignored that there are also complaints about the undue public sector interference, for instance in port business. A higher pursuit of compliance with public regulations should go in line with a higher degree of transparency in public sector interference. The scope and limitations of public interferences still seem to be insufficiently developed in many sectors in Angola.

Since public policies are being well developed in South Africa, the development of public policies in South Africa is a good example that Angola should look at and learn from.

Education and workforce

This section presents the core statements on education and workforce.[122]

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122   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-29-08	AO-29-10	AO-30-04	AO-30-06	AO-30-07	AO-30-08
AO-34-14	AO-34-15	AO-34-16	AO-34-18	AO-35-16	AO-36-05

Prior to the war as well as ten years after the beginning of the war, a good educational system and a good base of a skilled workforce existed. The prolonged war has destroyed the educational system and eroded the good base of a skilled workforce. Only a small share of the population was employed in the oil industry. The level of achievement in education and workforce has grounded to a halt and even reversed. Today, skilled labour is a scarce resource in Angola, even in the oil industry with its high number of expatriates.

When new staff join the company, they need to be educated in order to ensure that they meet the job requirements. Because of the scarcity of a sufficiently skilled workforce companies struggle in hiring the necessary staff to do business in Angola. The scarcity of a skilled workforce impedes seaports, agriculture, industrial production and freight forwarding operations and, thus, the recovery and development of the supply chain system in Angola.

Because of the scarcity of a skilled workforce in Angola, a foreign workforce is necessary to run businesses. However, foreign staff only provide a temporary solution. Once a foreign workforce leaves the country, the local workforce should take over. The local workforce often does not have the necessary qualifications to take over from foreigners. The workforce in Angola is often not sufficiently educated and trained. What is more, is that often, knowledge is not transferred from foreign to the local workforce.

For these reasons, there is a need for better education and training of the local workforce as well as a need for higher knowledge transfer. Improvements in education and training of the local workforce are of primary importance.

Some interviewees argue that basic, higher and professional including specialised education need to improve. Other interviewees argue that education entities for specialised professional education need to be established. Yet other interviewees plead that the necessary education entities exist, the low quality of education services lead to a low quality of education as well as poor education of workforce.

In order to facilitate knowledge accumulation in the local workforce, the government imposed a tax on the use of a foreign workforce. Despite a tax, the lack of a sufficiently skilled local workforce makes the use of a foreign workforce inevitable. Instead of

AO-36-35	AO-42-10				

penalising the use of a foreign workforce and thereby inhibiting knowledge transfer to the local population, the government should create incentives for companies to employ, educate and train the local workforce. The government should reward companies that are able to cope with the difficulties in labour supply and that are able to do business and run locations in Angola. By contrast, in Kenya, the government supports the education and training effort of companies.

Before an industrial production industry can be established in Angola, the education of the population and workforce needs to be increased. Before the country can regain its strengths in exports, the workforce needs to be trained in trade and export.

A combination of learning at school and training at companies should be established. The public vocational education provision is the responsibility of the government. A knowledge spillover by means of foreign direct investment in non-oil industries is necessary.

In general, because of the high degree of political and economic centralisation in Angola, the responsibility to improve the educational system lies with the government.

The scarcity of public funds could represent an obstacle to improvements in vocational education.

The short-term-oriented attitude and behaviour of the workforce make the recovery and development of the economy and supply chain system difficult. The workforce often places more value on achieving short-term objectives instead of pursuing medium or long-term relationships and objectives. This is a breeding ground for corruption. Thus, not only the scarcity of a skilled workforce, but also deficiencies in the attitude and behaviour of the workforce constrain a sustainable recovery and development of the supply chain system.

Since education and training of the population is being well developed in South Africa, the education and training system in South Africa is a good example that Angola should look at and learn from.

Transport system

This section presents the core statements on the transport system.[123]

Prior to the war, an adequate transport sytem existed in Angola. The transport system allowed transport and transhipment of goods nationwide. During the war, the transport infrastructure was destroyed and could not be reconstructed and developed. The war led to a collapse of the transport system.

As was pointed out earlier, since the colonial times, transport routes stretch from a port to the hinterland, but a domestic transport network that links major economic locations has not been developed in Angola. The stage of development of the transport infrastructure system is still low.

During the war, supply chains for non-military purposes were of little importance. At that time, military equipment imports to Angola and distribution throughout Angola were of primary importance. At that time, the public focus was on improving military supply chain performance. During the war, the country became isolated from international commercial supply chains.

A transport, transhipment and storage view still prevails in the supply chain industry in Angola. A more comprehensive and advanced supply chain view has not yet evolved in Angola. This situation stands in contrast to many developing and developed countries, where public and private organisations more and more embrace a supply chain or network view.

Today, there is either a lack of logistics options or the costs of the available options exceed the allowable logistics costs. The lack of an adequate transport system in Angola significantly contributes to the high costs of domestically produced goods. Thus, the costs of both imported as well as domestically produced goods are high in Angola.

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123   Reference table to the appendix publication, as explained in footnote 83 on page 146.

AO-01-02	AO-02-01	AO-29-10	AO-29-10	AO-29-22	AO-29-23
AO-29-25	AO-30-01	AO-30-02	AO-30-03	AO-30-04	AO-30-05
AO-30-08	AO-30-06	AO-30-15	AO-30-18	AO-35-01	AO-35-14
AO-36-33	AO-36-34	AO-36-35	AO-42-21	AO-42-23	

The high costs of goods in Angola make locally produced production too cost-intensive to be competitive in international markets. Hence, still today the role of the economy of Angola during the colonial period as well as the war explain the poor state and performance of the transport system in Angola.

The transport system of the oil and gas industry is specific and limited to the oil and gas industry.

Since the end of the war, the transport infrastructure is being reconstructed and developed. Since then, substanstial improvements in transport infrastructure have been achieved. The government has financed logistics centres to foster transport and trade throughout Angola. There are, however, still significant deficiencies in the transport system in Angola. Many reconstruction and development projects are still at a feasibility stage and not yet realised.

The demand for goods is increasing, the Angolan population is growing and since the end of the war, the country has become increasingly engaged in international trade. To trade with other countries, the transport system of Angola needs to comply with international standards. In order to keep pace with this development, the transport system needs to be improved.

Plans and actions to improve the transport system in Angola are the responsibility of the public and private sector. Other interviewees state that the public sector is responsible for improving the transport system of Angola.

An example of a well performing transport and transhipment system that Angola should look at and learn from exists in South Africa. The high performance of the distribution system allows South Africa to distribute goods at low costs and thereby contributes to the performance of the manufacturing industry in South Africa.

Despite the relatively high costs of airfreight compared to road and rail freight, in Angola airfreight is an important mode of domestic transport of basic general freight. Typically, airfreight becomes relevant in case of long distances, time criticality and / or high value of freight. The fact that even basic, general goods are transported by air points to deficiencies in road and rail transport in Angola.

There are, however, some obstacles to improvements of the transport system in Angola. First, it will take considerably more than a decade for the country to catch up with the level of development of the transport system that has been achieved in many

developing and developed countries. Second, the level of qualification as well as atti-tude of the workforce is not conducive to sustainable improvements in the transport system and may hinder improvements in the transport system.

6.3.2 Namibia

This section sheds light on the various statements that interviewees made with regard to weaknesses, areas and actions for improvements, obstacles as well as responsi-bilities of seaport, road transport network, rail transport network as well as manufac-turing location performance in Namibia. Moreover, it presents and interprets the com-bined importance and performance attribute values of each domain in Namibia.

6.3.2.1 Seaports

The core statements on seaports are sorted according to the following sections, namely, port performance, cargo volume, port operations, port management, educa-tion and workforce, port charges, hinterland transport as well as cross-cutting issues. The presentation of statements in categories is followed by the presentation and in-terpretation of combined importance and performance values of seaport attributes.

Port performance

This section presents the core statements on port performance.[124]

10 years ago, the performance of the port of Walvis Bay was higher than today. How-ever, the performance of the port of Walvis Bay is still good. Other interviewees op-pose that during the last 16 years, ports in Namibia have significantly been developed. The performance of the port of Walvis Bay as well as of the port of Lüderitz is good. Both ports are continuously developed according to market requirements.

The port performs well, although, some weaknesses exist. The port of Walvis Bay works well compared to other ports on the African continent. The performance of the port of Walvis Bay is, however, far behind the performance of ports on the European continent. The port of Walvis Bay is one of the best performing ports on the west coast

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124   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-15-02	NA-16-12	NA-18-01	NA-20-02	NA-20-10	NA-20-11
NA-20-12	NA-21-03	NA-21-04	NA-22-07	NA-23-11	NA-26-23
NA-26-24	NA-27-03	NA-39-12			

of the African continent. Nevertheless, it should be taken into account that cargo volumes are much lower in Namibia than in Angola and South Africa. It is particularly the high demand for port services at the port of Durban that causes congestion. Higher volumes in Angola and South Africa contribute to congestion. Because of lower volumes and lack of congestion, the port of Walvis Bay is able to provide a higher performance.

Once the port expansion is complete, the country will have an excellent port with new equipment. Then, the port of Walvis Bay will represent a strength of the transport system in Namibia.

The port of Walvis Bay is of particular importance to the economy of Namibia.

Cargo volume

This section presents the core statements on cargo volume.[125]

The cargo volume at the port of Walvis Bay is still low compared to ports in other countries, such as in South Africa and Angola. The number of direct sailings going in and out of Namibia is low compared to ports in South Africa. The specialisation of ports in South Africa, such as the port of Cape Town, makes South African ports attractive for Namibian cargo as well. The port of Walvis Bay attracts fewer shipping lines and, thus, there is less competition between shipping lines compared to ports in South Africa. This causes additional costs for port users. Other interviewees plead, however, that companies increasingly consider the port of Walvis Bay as an alternative and make use of it, although volumes are not as high as they are supposed to be.

Because of different market requirements, the port of Walvis Bay will get a share of the overall business volume in southern Africa. The port of Walvis Bay will, however, not achieve the same performance and volume as ports in South Africa. Because business volumes are increasing in the SADC, even if the port of Walvis Bay gains in volume, their market share will not increase to the same extent.

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125   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-13-01	NA-13-02	NA-15-10	NA-15-11	NA-16-08	NA-16-09
NA-16-10	NA-20-06	NA-20-13	NA-22-06	NA-23-03	NA-23-04
NA-23-13	NA-26-23	NA-26-24	NA-39-07	NA-39-14	ZA-37-07

In order to compensate for higher costs at the port of Walvis Bay compared to ports in South Africa, the port company should examine whether improvements in productivity would reduce costs and offer lower port charges. In addition, the government should reconsider whether ports should serve as a source of public income or as a means to enable trade through Namibia.

There is a need to intensify cooperation with neighbouring countries in order to make use of the port capacity. Partnerships with neighbouring countries are expected to lead to higher volumes at the port of Walvis Bay. The ongoing port expansion is expected to attract more shipping lines. In the future, the port of Walvis Bay will become more important in southern Africa.

From the first half-year of 2016 to the first half year of 2015, the port of Walvis Bay recorded a 50 per cent drop in container transhipment volume. Cargo volumes through the port of Walvis Bay dropped significantly in 2016. Since 2015, the economic recession and resulting scarcity of funds and foreign exchange in Angola led to a substanstial reduction in demand for goods and transport services from Angola. The lower demand from Angola contributed to lower port and hinterland transport volumes. The current low cargo volume at the port of Walvis Bay places a burden on the ongoing expansion of the port of Walvis Bay. The current economic situation is poor. Import volumes will increase again, but not to the same level as before the economic downturn.

The role as a transit country makes the economic situation dependent on the demand for goods and transport services and economic situation of neighbouring countries.

There is an imbalance between imports and exports in Namibia, like in many other countries in southern Africa, such as Angola, as well. In the past, import volumes exceeded export volumes. Now, since the drop in port volume, exports exceed imports. Imbalances between imports and exports cause higher costs. To reduce the costs, this gap needs to be reduced.

Port operations

This section presents the core statements on port operations.[126]

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126   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| NA-20-04 | NA-20-08 | NA-20-09 | NA-20-14 | NA-20-20 | NA-21-07 |

The port works generally well; but there is room for improvement.

Port processes could be faster. There is a need for improvements in loading and unloading of vessels. The terminal operating hours should be increased in order to improve port performance. Other interviewees state that cargo handling is very fast.

Import processing takes too much time. High import time often causes additional port storage charges. High import time is traced back to inefficiency of customs processes, to a lack of qualification as well as to a lack of capacity of customs staff. Deficiencies in import declarations cause additional time and costs. In addition, bottlenecks result from the abolition of pre-clearance along with the limited free storage time and insufficient storage capacity. The insufficient performance of customs import processes impedes imports to Namibia. During the past months, the customs authority recognised that there is a bottleneck and started to take actions of improvement. Despite a new customs clearance system, including the possibility to submit customs entries online, there is still a need to hand in paper documents. The customs system is not as developed as in South Africa. There is a need for higher digitisation of customs document processes.

The operating hours of the customs authority for clearance and releases is not sufficient. The office hours of the cargo release desk at the port of Walvis Bay are too short. In the future, increased cargo volumes are likely to justify longer office hours. In order to extend office hours, there is a need for more staff.

It takes more time to import than to export cargo. Customs wants to ensure that import duties are applied correctly. There is a fear that a full inspection of import cargo by means of x-ray scanners leads to congestion at the port and causes additional time and costs.

The performance of the customs authority needs to improve. There is a need for improvements in customs processes. The customs authority should understand its role as a service provider. There is a need for improvements in customs from the port to the border of neighbouring countries.

NA-21-08	NA-21-09	NA-21-09	NA-21-10	NA-22-09	NA-23-05
NA-23-06	NA-23-07	NA-23-09	NA-23-11	NA-23-12	NA-27-03

The customs authority is responsible for taking actions for improvement. The customs authority is taking actions for improvement. However, the speed of implementation is too low. In adopting new technologies, Namibia is always a bit behind South Africa.

An example of shorter customs process time that Namibia could look at and learn from exists in South Africa.

Because deficiencies in the customs system do not only affect ports, but the other supply chain domains as well, a comprehensive analysis of deficiencies in the customs system follows in section 6.3.2.5 on the supply chain system of Namibia.

High import time is also attributed to the carelessness and lack of experience of importers.

The port of Walvis Bay should understand its role as a service provider and align its services more to the need of its customers.

Port management

This section presents the core statements on port management.[127]

The port company has a good strategy and plans, but training and commitment to put plans into action are not sufficient. Other interviewees state that the port company continuously aligns its business towards customer needs. This includes their management organisation, their equipment as well as their accounting system. The port company will continue to increase port performance in Namibia. Similarly, other interviewees state that it is the good management that explains the good performance of the port of Walvis Bay.

Education and workforce

This section presents the core statements on education and workforce.[128]

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127   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| NA-21-03 | NA-21-06 | NA-22-03 | NA-22-08 | | |

128   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| NA-27-04 | | | | | |

Once the port volumes increase after the port expansion, there may be a shortage in well-educated and trained workforce.

Port charges

This section presents the core statements on port charges.[129]

The annual amount of increase in port charges is excessively high. Port users do not have a say in the tariff setting. Because the port company is in a monopoly situation, they do not feel the need to place more value on customer needs. Other interviewees point out that port charges are lower than in other ports in southern Africa.

Hinterland transport

This section presents the core statements on hinterland transport.[130]

After the expansion, the port does not represent a bottleneck anymore. Now, it is necessary to address deficiencies in road and rail transport. The port of Walvis Bay can become a major gateway and Namibia a logistics hub for southern Africa. That requires, however, that the supporting infrastructure, such as road hinterland transport as well as customs services, is developed accordingly.

An expansion of the port capacity is not sufficient to handle higher volumes through the port of Walvis Bay and Namibia. The capacity needs to be aligned along the entire transport corridor. The hinterland transport capacity will not be sufficient to handle expected future cargo volume. This includes lorry parks, distribution centres, road transport as well as rail transport routes.

10 years ago, the interface between the port and the railway was better. The interface between the port of Walvis Bay and rail transport is a weakness. A lack of traction units to move waggons and a lack of cargo handling equipment impede a smooth transhipment between port and rail transport operations. The coordination and com-

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129   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-20-05	NA-21-05				

130   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-16-12	NA-18-19	NA-19-03	NA-19-05	NA-20-07	NA-20-10
NA-20-15	NA-22-01	NA-22-02	NA-22-04	NA-22-05	NA-22-10
NA-22-14	NA-23-15				

munication between the port and rail transport company does not work well. The marshalling of loading units and waggons is not synchronised. Container return by rail often exceeds the permitted time and causes additional costs. Improvements in rail transport equipment are the responsibility of the rail transport company.

The port of Walvis Bay does not have a lorry park where lorries can wait for cargo pickup or collection. Because of the lack of a lorry park, the city becomes congested.

The expansion of the port and the increase in cargo and traffic volume is likely to cause congestion on the outbound routes of the port of Walvis Bay. The road infrastructure needs to be developed according to traffic and freight volumes. The construction of a new, more capable road from Walvis Bay to Swakopmund will only start one or two years after completion of the massive port expansion. The increase in traffic will lead to higher congestion.

A plan to build a transport corridor from the port of Walvis Bay to the south of the country never got off the ground.

There is a lack of distribution centres at the port of Walvis Bay. Currently, because of well-established supply chains through South Africa and the high share of imports that are carried by road transport from South Africa to Namibia, most distribution centres are located in Windhoek. A sufficient number of distribution centres, especially for cold storage, need to be provided at the port of Walvis Bay in order to establish a logistics hub in Namibia. Anchor clients should be attracted in order to strengthen the Walvis Bay Corridor. However, because of the scarcity of space around the port, not enough space can be allocated to distribution centres and lorry parks. Property prices are excessively high in Walvis Bay. Other interviewees oppose that the government does not allocate enough land for the port expansion.

The dry ports at the port of Walvis Bay along with the planned extension of the railway line on the Walvis Bay-Ndola-Lubumbashi as well as Trans-Kalahari-Corridor will allow the use of the higher capacity of the port of Walvis Bay.

Cross-cutting issues

This section presents the core statements on cross-cutting issues.[131]

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131   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| NA-20-16 | NA-23-10 | NA-23-15 | NA-24-24 | | |

Port users are responsible for putting pressure on the government and port through a number of local business associations to take further steps for improvement. The government and the port company are responsible for implementing actions for improvement.

Although the port of Walvis Bay is in a monopoly situation in Namibia, it considers itself as the preferred port. Private companies are exerting pressure on the port company in order to provoke improvements in port performance.

Privatisation of selected parts of the logistics chain could provide value to the country. Private sector participation in ports could exert some pressure on the port company and contribute to higher port performance.

Because the port of Walvis Bay is a public enterprise, the responsibility for improving port performance lies with the government.

Importance and performance of seaport attributes

Figure 6-9 illustrates the average relative importance values[132] of seaport attributes across countries as well as the average performance values[133] of these attributes in Namibia. To recap, 18 respondents evaluated the importance of seaport attributes. Seven respondents rated the performance of seaport attributes in Namibia. Due to the low number of respondents, the questionnaire and the personal interview results should be analysed coherently in order to provide a meaningful picture.

To give an overview, respondents assigned a good rating to the port performance in Namibia.[134] Whilst respondents assigned a good to fair performance rating to public policies and services as well as landward accessibility, respondents assigned a good

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[132]   For ease of interpretation and analysis, the average relative importance values have been translated into verbal expressions, by means of the following scheme: standard deviation (σ) = 9.1 %; mean (μ) = 20 %; μ - 1σ = 10.9 %; μ + 1σ = 29.1 %

μ + 1σ	<	x	≤	100 %	High
μ		<	x	≤	μ + 1σ	Medium to high
μ - 1σ	≤	x	<	μ	Medium to low
0 %		≤	x	<	μ - 1σ	Low

[133]   For ease of interpretation and analysis, the average degree of agreement values have been translated into verbal expressions, by means of the following scheme:
1.0 – 2.4   Strong agreement   Good
2.5 – 3.4   Slight agreement   Good to fair
3.5 – 4.4   Slight disagreement   Fair to poor
4.5 – 6.0   Strong disagreement Poor

[134]   The mean value and standard deviation across all five attributes of port performance in Namibia is 2.2 and 0.5, respectively.

performance rating to infrastructure, operations as well as seaward accessibility – in ascending order. With this overview in mind, this section now presents the details by attribute.

Figure 6-9: Importance and Performance – Seaports Namibia
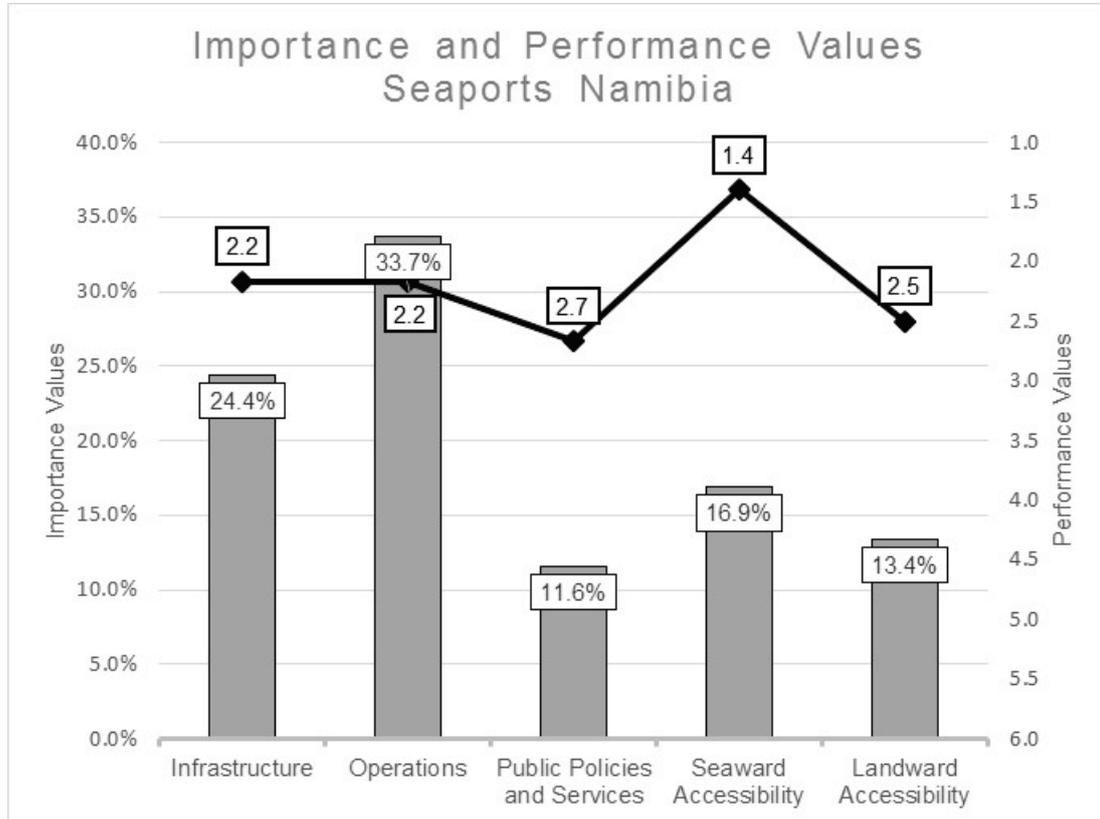
First, the "equal weight" procedure is applied. This procedure yields the following picture and leads to the following conclusions.[135]

Respondents assigned a medium to high importance (24.4 %) as well as a good performance rating (2.2) to infrastructure. A medium to high importance would even justify a lower than good performance. Thus, the infrastructure does not seem to represent a constraint to seaport performance in Namibia.

Respondents assigned a high importance (33.7 %) as well as a good performance rating (2.2) to operations. The high importance is in line with the good performance rating. Thus, the operations do not seem to represent a constraint to seaport performance in Namibia.

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135   The "equal weight" procedure gives an equal weight to the importance and performance component, as described in section 6.3.1.1 on page 158.

Respondents assigned a medium to low importance (11.6 %) as well as a good to fair performance (2.7) to public policies and services. The medium to low importance would even justify a lower performance. Thus, the public policies and services do not seem to represent a constraint to seaport performance in Namibia.

Respondents assigned a medium to low importance (16.9 %) as well as a high performance (1.4) to seaward accessibility. The medium to low importance would even justify a lower performance. Thus, the seaward accessibility does not seem to represent a constraint to seaport performance in Namibia.

Respondents assigned a medium to low importance (13.4 %) as well as a good to fair performance (2.5) rating to landward accessibility. The medium to low importance would even justify a lower performance. Thus, landward accessibility does not seem to represent a constraint to seaport performance in Namibia.

Second, the "higher weight towards performance" procedure is applied. [136] This procedure yields the following picture and leads to the following conclusions: Public policies and services received the lowest performance value. Thus, public policies and services seem to represent a constraint to seaport performance in Namibia.

Consequently, all in all, the public policies and services seem to represent a constraint to seaport performance in Namibia. The limited database does not allow for further differentiation. Additional sources of information will allow for a further differentiation at a later stage.

6.3.2.2 Road Transport

The core statements on road transport networks are sorted according to the following sections, namely, road transport performance, road infrastructure, cross-border transport, transport regulation, education and workforce, road freight rates, customs procedures as well as cross-cutting issues. The presentation of statements in categories is followed by the presentation and interpretation of combined importance and performance values of road transport network attributes.

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136   Provided that an attribute is important, irrespective of the actual level of importance, the "higher weight towards performance" procedure gives a higher weight to the performance component, as described in section 6.3.1.1 on page 159.

Road transport performance

This section presents the core statements on road transport performance.[137]

Road transport performance in Namibia is not as good as road transport performance in South Africa. Nonetheless, road transport performance in Namibia is good. After independence, road transport even gained in importance in Namibia. Road transport is the most reliable mode of transport, both on domestic as well as cross-border routes. For reliable and timely transport, there is no alternative to road transport in Namibia. The good road transport performance explains its high market share. Road transport will remain the most important mode of transport in Namibia for the foreseeable future.

Road infrastructure

This section presents the core statements on road infrastructure.[138]

The road infrastructure from Karibib to Otjiwarongo is in a poor condition. On some sections, the road infrastructure does not comply with the SADC standard. Other interviewees state that the infrastructure of most roads in Namibia is good. The state of gravel roads is good and gravel roads are well maintained. Whilst the state of road infrastructure from Walvis Bay to Otjiwarongo is poor, the state of infrastructure from Walvis Bay to Karibib is good.

The state of road infrastructure is good compared to other countries, such as Angola. The state of the road infrastructure is similar to well-developed regions in Europe. Other interviewees state that the road infrastructure in Namibia is excellent.

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137   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| NA-16-13 | NA-19-02 | NA-21-12 | NA-24-08 | NA-26-26 | NA-39-13 |
| ZA-01-16 | | | | | |

138   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-16-19	NA-18-07	NA-19-01	NA-19-03	NA-19-04	NA-19-05
NA-19-17	NA-20-16	NA-20-21	NA-21-17	NA-22-01	NA-22-11
NA-22-13	NA-24-01	NA-24-03	NA-24-08	NA-24-09	NA-24-11
NA-24-14	NA-24-15	NA-24-19	NA-24-20	NA-25-04	NA-26-07
NA-26-20	NA-26-27	NA-26-28	NA-26-34	NA-27-05	NA-27-07
NA-27-08	NA-39-17	ZA-31-11			

The construction, enhancement and maintenance of road infrastructure during South African administration explains the good state of road infrastructure in Namibia.

The road infrastructure is deteriorating. The deterioration of the road infrastructure raises concerns about the ability of the transport network to absorb the expected increase in cargo volume. There is too much traffic and freight on the roads. The road transport system is not supported by a rail transport system. The insufficient rail transport performance leads to higher freight on roads and keeps the high volume of freight on roads. The almost exclusive reliance of transport on road transport places an excessive burden on road infrastructure and puts the sustainability of road infrastructure at risk. Road transport needs to absorb the largest share of freight volume and this increases the burden on road infrastructure. There is a need for a shift of freight from road to rail. The country is in need of a rail transport system that supports the road transport system.

Wear and tear of the road infrastructure is higher than the maintenance of the road infrastructure. There is a risk that the most important mode of transport in Namibia is becoming considerably costlier and may impede transport in Namibia. There is a need for higher maintenance. Investments in road transport infrastructure are not done in accordance to usage. The road authority does not meet the demand for maintenance and reconstruction of road infrastructure. Other interviewees state that the roads contractor company performs well in maintaining the road infrastructure. Their workforce has the necessary skills to maintain the road infrastructure well. Currently, revenues from road usage charges are not earmarked for investments in the road transport system. Investments in road infrastructure should be made according to depletion of infrastructure and revenue volume from user charges. However, there is competition for public funds between transport and economic development objectives.

Behind the background of the positioning of the country as a logistics hub in southern Africa, the road network needs to be enhanced. Once the port expansion is complete, freight volume will exceed the capacity of roads. The expansion of the port of Walvis Bay may cause congestion on the outbound roads. The road infrastructure needs to be developed according to the traffic and freight volume. The number of lanes as well as road width needs to be increased on certain routes and sections. To keep the state of road infrastructure, certain rail lines should be extended to neighbouring countries. More freight to and from the port should be carried on railways.

A strategy to improve the road transport network exists and actions take place. The road infrastructure between Windhoek and Okahandja is being extended to provide a higher capacity to the north and to the coast. The government is investing a lot. The government plans to extend a number of road sections. The government put out a tender to extend the section between Swakopmund and Karibib. The government plans to upgrade the gravel road between Swakopmund and Uis as well as between Gobabis and Grootfontein to tarred roads.

Improvements in roads should consider an extension of the B1 between Rehoboth and Windhoek as well as Windhoek and Grootfontein. At best, the entire road network would be of the same state as the road section on the Trans-Kalahari-Corridor between the port of Walvis Bay and Windhoek.

The continual development of the road infrastructure decides on the performance of the road transport system. The continual development of the road infrastructure is the responsibility of the government.

However, because the road upgrading comes at significant costs, the high costs represent an obstacle to a further upgrading. The lack of funds may constrain improvements in road infrastructure.

Because the road authority is a public agency under the ministry of transport, the responsibility for improvements in the road infrastructure lies with the public sector.

Cross-border transport

This section presents the core statements on cross-border transport.[139]

Often, lorry drivers face difficulties at border posts of neighbouring countries with regard to entry requirements and passports as well as corruption. These difficulties impede cross-border transport. Other interviewees state that since transport corridors are actively managed, crossing borders to neighbouring countries, such as Zambia and Botswana, takes place without major issues.

The cross-border transport performance in Namibia is lower than in South Africa. Nonetheless, cross-border transport performance in Namibia is much higher than in

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139   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-16-13	NA-21-12	NA-21-15	NA-23-12	NA-23-17	NA-24-07
NA-24-20	NA-28-01	NA-28-02	NA-39-13		

other countries in southern Africa. Road transport is the most reliable transport mode in Namibia, in domestic as well as cross-border transport. The good cross-border transport performance results from the good road infrastructure, the good state of transport vehicles, good law enforcement with regard to roadworthiness of vehicles as well as good customs lead time at borders.

There are differences in the stage of development between transport corridors in Namibia. The transport corridor between Namibia and South Africa is well developed. The corridors from the port of Walvis Bay to the other neighbouring countries are still developing. The corridors to Angola and Zambia work well. The corridors to Botswana and Zimbabwe are in need of higher volumes. Some corridors suffer from a lack of capacity.

Lorry drivers need a place to stop and rest; there are issues with lorry parks.

Investments should be made in electrical infrastructure and single windows at border posts.

Improvements in roads should consider a facilitation of lorry border crossings.

Transport regulation

This section presents the core statements on transport regulation.[140]

Transport regulation is a weakness in Namibia.

The accident rate on roads is high. The insufficient degree of transport and traffic regulation leads to the high number of accidents. There is a need for more measures to prevent traffic accidents. The insufficient degree of regulation leads to a higher accident rate. There are no driving and rest period regulations. Because mandatory driving and rest period regulations could place an excessive burden on the transport industry, interviewees are in favour of voluntary regulations. The responsibility to implement regulations on driving and rest periods lies with the transport inspectorate as well as the ministry of transport. The public sector is in favour of limiting lorry driving hours to daytime. However, lorry driving hours during day and night time regulate traffic flows more smoothly and thereby reduce accidents. The public sector is not

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140   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-22-12	NA-22-13	NA-24-04	NA-24-05	NA-24-06	NA-24-07
NA-24-08	NA-24-10	NA-24-16	NA-24-17		

adequately informed about the advantages and disadvantages of each approach. In addition, the traffic police could do more to prevent traffic accidents.

There is too much overloading of lorries. Overloading leads to faster deterioration of the road infrastructure. Some interviewees state that in order to illegally circumvent load regulations, road transport companies take advantage of the closure of weigh-bridges and lack of traffic controls during the night. Other interviewees, however, point out that the introduction of load controls contributed to the high compliance with load limitations.

The unlawful circumvention of mass distance charges puts compliant companies at a disadvantage.

Different gross vehicle weight limitations between neighbouring countries limit the maximum payload of lorries on cross-border transport. Gross vehicle weight limitations should be harmonised among countries in southern Africa.

The weakness in regulation is attributed to a lack of competence at the legislator. In addition, the rivalry between the logistics hub strategy in Namibia and South Africa make decision makers in public entities reluctant to accept advice from South African public entities.

Education and workforce

This section presents the core statements on education and workforce.[141]

There are shortages in skills.

In the past, education and training of logistics professionals did not take place. It is only now that education and training of logistics professionals takes place in Namibia. There is a demand for logistics professionals.

Some transport companies are said to apply discriminatory behaviour with regard to staffing decisions. National languages are a prerequisite at some companies. Young graduates face difficulties at the labour market.

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141   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-19-07	NA-19-08	NA-19-10	NA-23-18		

Deficiencies in education and workforce do not only affect road transport, but the other supply chain domains as well. Thus, a comprehensive analysis of deficiencies in education and workforce follows in section 6.3.2.5 on the supply chain system of Namibia.

Road freight rates

This section presents the core statements on road freight rates.[142]

Road transport rates increased significantly between 2007 and 2016. Similarly, other interviewees state that over the last years, road freight rates increased excessively. The road freight rates are high. The high road transport rates reduce the competitiveness of the Walvis Bay Corridor. It is less cost-intensive to carry goods from Durban to Zambia, than Walvis Bay to Zambia. The rail transport performance should be increased in order to provide an alternative to road transport and reduce the costs of transport in Namibia.

As was already pointed out with regard to the road infrastructure, the excessive use of road transport accelerates the deterioration of the road infrastructure and eventually leads to an increase in road freight rates. There is a risk that the most important mode of transport is becoming considerably costlier and, thereby, could place a burden on supply chain performance. Other interviewees state that road transport is a cost-efficient mode of transport. Little congestion, low fuel prices as well as low labour costs contribute to the high cost efficiency. The road freight rates are good compared to Angola.

Interviewees expect that the value of the local currency will further decrease in value and thereby lead to higher import costs of fuel for transport vehicles. This, in turn, will cause cost increases of road transport and make transport through Namibia more cost-intensive. Eventually, trade and transport through Namibia will reduce in the future.

In the past, transport licences were necessary to operate on the road transport market in Namibia. By doing so, the public sector created an oligopoly market situation and limited competition. Other interviewees remark that, today, the freedom of carbotage

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142   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-16-02	NA-19-02	NA-20-22	NA-22-15	NA-22-16	NA-24-02
NA-24-08	NA-24-10	NA-24-11	NA-24-12	NA-26-27	

increases competition among transport operators and reduces transport rates. There are a good number of road transport operators for a number of routes and types of goods. The number of transport operators is high, compared to DR Congo and Zambia.

Higher competition and a reduction of transport rates confirms the effectiveness of the strategy of the Walvis Bay Corridor Group. The market for transport services is liberalising more. Due to market liberalisation, there is no deterioration of transport operator performance.

Customs processes

This section presents the core statements on customs processes.[143]

Because online documents cannot legally be accepted by customs, there is still a need to submit paper-based documents. Whilst online document submission is still to come in Namibia, it is already in use in South Africa. There are plans to set up single windows. At the border to Botswana, a single window one-stop border post is being implemented.

Deficiencies in the customs system do not only affect road transport, but the other supply chain domains as well. Thus, a comprehensive analysis of deficiencies in the customs system follows in section 6.3.2.5 on the supply chain system of Namibia.

Cross-cutting issues

This section presents the core statements on cross-cutting issues.[144]

The ministry of transport is responsible for improving the public part of the transport system.

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143   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-24-20	NA-39-01				

144   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-19-12					

Importance and performance of road transport network attributes

Figure 6-10 illustrates the average relative importance values[145] of road transport network attributes across countries as well as the average performance values[146] of these attributes in Namibia. To recap, 16 respondents evaluated the importance of road transport network attributes. Eight respondents rated the performance road transport network attributes in Namibia. Due to the low number of respondents, the questionnaire and the personal interview results should be analysed coherently in order to provide a meaningful picture.

To give an overview, respondents assigned a good to fair rating to road transport performance in Namibia.[147] Respondents assigned a good to fair performance rating to equipment and facilities, public policies and services, transhipment centres, infrastructure as well as transport operations – in ascending order. With this overview in mind, this section now presents the details by attribute.

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145   For ease of interpretation and analysis, the average relative importance values have been translated into verbal expressions, by means of the following scheme: standard deviation (σ) = 11.8 %; mean (μ) = 20 %; $\mu - 1\sigma$ = 8.2 %; $\mu + 1\sigma$ = 31.8 %

    $\mu + 1\sigma \ < \ x \ \leq \ 100 \ \%$ High
    $\mu \ \ \ \ \ < \ x \ \leq \ \mu + 1\sigma$ Medium to high
    $\mu - 1\sigma \ \leq \ x \ < \ \mu$ Medium to low
    $0 \ \% \ \ \ \ \ \leq \ x \ < \ \mu - 1\sigma$ Low

146   For ease of interpretation and analysis, the average degree of agreement values have been translated into verbal expressions, by means of the following scheme:
    1.0 – 2.4   Strong agreement   Good
    2.5 – 3.4   Slight agreement   Good to fair
    3.5 – 4.4   Slight disagreement   Fair to poor
    4.5 – 6.0   Strong disagreement Poor

147   The mean value and standard deviation across all five attributes of road transport network performance in Namibia is 2.8 and 0.2, respectively.

Figure 6-10: Importance and Performance – Road Transport Namibia
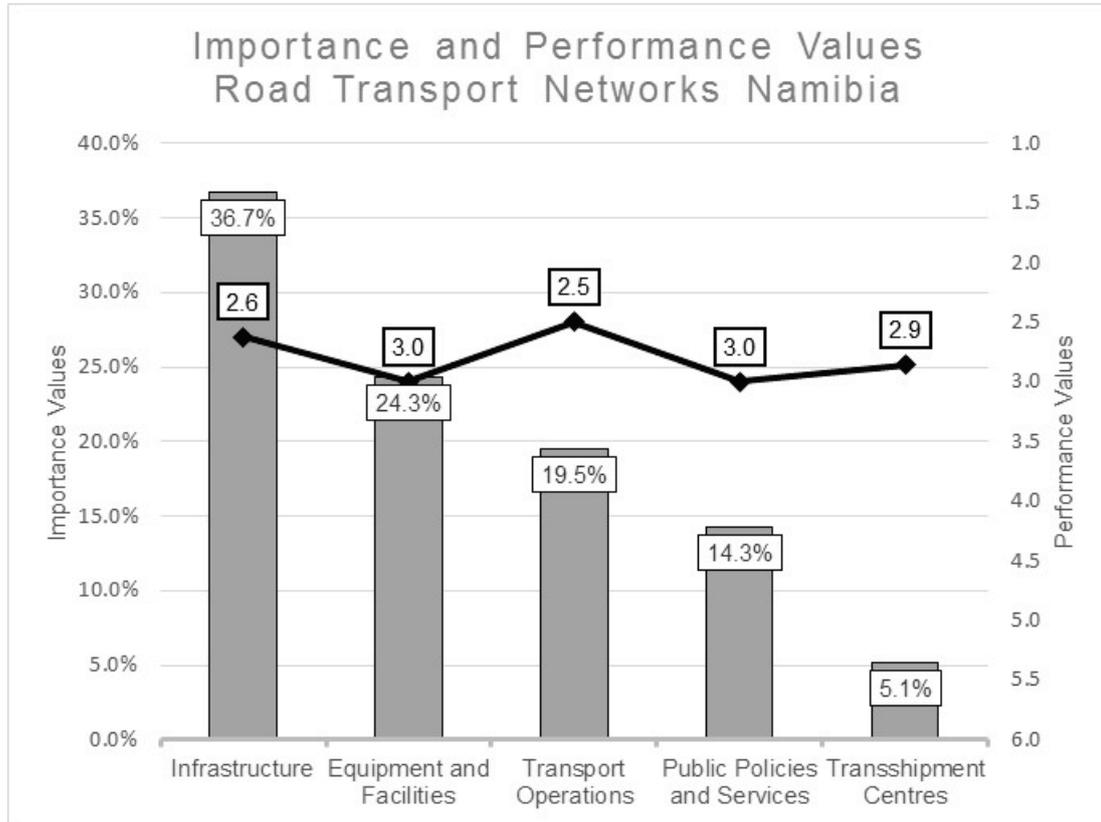
First, the "equal weight" procedure is applied. This procedure yields the following pic-ture and leads to the following conclusions.[148]

Respondents assigned a high importance (36.7 %) as well as a good to fair perfor-mance (2.6) to infrastructure. The high importance argues for a higher than good to fair performance. Thus, the infrastructure seems to represent a constraint to road transport performance in Namibia.

Respondents assigned a medium to high importance (24.3 %) as well as a good to fair performance (3.0) to equipment and facilities. The medium to high importance is in line with the good to fair performance. Thus, the operations do not seem to repre-sent a constraint to road transport performance in Namibia.

Respondents assigned a medium to low importance (19.5 %) as well as a good to fair performance (2.5) to transport operations. Albeit close to the threshold, the medium to low importance would even justify a slightly lower performance. Thus, the transport

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148   The "equal weight" procedure gives an equal weight to the importance and perfor-mance component, as described in section 6.3.1.1 on page 158.

operations do not seem to represent a constraint to road transport performance in Namibia.

Respondents assigned a medium to low importance (14.3 %) as well as a good to fair performance (3.0) to public policies and services. The medium to low importance would justify a lower performance. Thus, the public policies and services do not seem to represent a constraint to road transport performance in Namibia.

Respondents assigned a low importance (5.1 %) as well as a good to fair performance (2.9) to transhipment centres. The low importance would even justify a lower performance. Thus, the transhipment centres do not seem to represent a constraint to road transport performance.

Second, the "higher weight towards performance" procedure is applied.[149] This procedure yields the following picture and leads to the following conclusions: Equipment and facilities as well as public policies and services received the lowest performance. Thus, equipment and facilities as well as public policies and services seem to represent constraints to road transport performance in Namibia.

Consequently, all in all, infrastructure, equipment and facilities as well as public policies and services seem to represent constraints to road transport performance in Namibia. The limited database does not allow for further differentiation at this stage. Additional sources of information will allow for further differentiation at a later stage.

6.3.2.3 Rail Transport

The core statements on rail transport networks are sorted according to the following sections, rail transport performance, rail infrastructure, rolling stock, security and visibility, management and organisation, education and workforce, competition as well as cross-cutting issues. The presentation of statements in categories is followed by the presentation and interpretation of combined importance and performance values of rail transport network attributes.

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149   Provided that an attribute is important, irrespective of the actual level of importance, the "higher weight towards performance" procedure gives a higher weight to the performance component, as described in section 6.3.1.1 on page 159.

Rail transport performance

This section presents the core statements on rail transport performance.[150]

In the past, rail transport performance was higher than it is today. A much higher share of bulk goods was carried by rail transport than today. Until the change of the political and economic system, rail transport worked well. During the last 20 years, rail transport performance deteriorated. Apart from the mines, former rail transport customers reacted to the deterioration in rail transport performance by shifting their freight to road transport. Not only general freight but also bulk freight moved to road transport. Today, most freight is carried on roads in Namibia; only a small share is carried on railways.

Rail transport performance is poor. Rail transport performance is fair only for high volume and high weight freight. For high volume and high weight goods, such as concrete, rail transport performance is fair. Because of higher business volume, freight of mines is handled with higher priority and, thus, is often given preferential treatment. Rail transport does not meet the requirements of the market anymore. Rail transport is the weakest link in the transport system in Namibia. Rail transport performance is far below road transport performance. Rail transport has been replaced by road transport and the importance of rail transport is becoming insignificant. The speed of rail transport is low. Because of the low performance of rail transport in Namibia, most companies make use of road transport. The low speed explains why most companies make use of road transport. In addition, rail transport does not provide an alternative or complementary mode to road transport. This, however, places a higher burden on road transport infrastructure. There is too much freight and traffic on roads.

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150   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-15-15	NA-16-03	NA-16-16	NA-16-17	NA-16-19	NA-16-20
NA-18-07	NA-18-09	NA-19-02	NA-19-16	NA-19-17	NA-21-18
NA-21-20	NA-21-22	NA-22-01	NA-22-13	NA-22-19	NA-22-20
NA-23-20	NA-24-13	NA-24-19	NA-25-06	NA-25-07	NA-25-09
NA-26-12	NA-26-20	NA-26-29	NA-26-31	NA-26-34	NA-26-35
NA-27-08	NA-27-09	NA-39-15	NA-39-17	NA-39-19	NA-39-22
NA-39-23					

For reliable and timely transport, there is no alternative to road transport in Namibia. The insufficient rail transport performance explains the good road transport performance. Because of low rail transport performance, it is road transport that maintains supply chain performance in Namibia.

Other interviewees point out that requirements to transport are higher today and rail transport is not able to meet these requirements anymore. Rail transport is not the most suited mode of transport to meet today's requirements to transport. Yet other interviewees state that high volume and weight goods necessitate rail transport.

On direct routes, e.g. between Walvis Bay and Windhoek, rail transport performance is fair. However, once there is a need for transhipment, there is a risk of delays.

The rail transport system is able to provide an adequate transport performance; however, the communication between the rail transport company and its customers does not work well.

Interviewees state that there are different views on the actual performance of rail transport in Namibia between the public rail transport company and the private sector. Despite significant deficiencies in rail transport performance, the rail transport company will deny it.

For many years, rail transport has been a challenge in many countries on the African continent, not just in Namibia. Despite awareness of the importance of rail transport, the actions for improvement are still insufficient. During the last three years, there have been no major improvements. There is a need for higher regional integration in rail transport in southern Africa.

Many factors are in need of improvement. There have been attempts to improve the rail transport performance; however all attempts failed. Other interviewees state that the rail transport company took actions to improve rail transport performance; however, the rail transport performance still does not meet the requirements of the market. Road transport will remain the major mode of transport in Namibia, at least in the near to medium future.

Rail transport performance needs to improve in order to reduce the load on road infrastructure. The rail transport system needs to improve in order to increase supply chain performance. Some railways need to be extended to neighbouring countries in order to maintain the state of the road infrastructure. The share of bulk goods that is

carried by rail transport needs to increase. More freight to and from the port of Walvis Bay should be carried on railways.

The lack of a railway that supports the logistics hub concept represents a constraint to the realisation of the logistics hub concept. Rail transport performance needs to improve in order for Namibia to become a logistics hub. If the rail transport system is not sufficient to support the road transport system when volumes start to increase, the excessive traffic and freight on roads will cause congestion and damage the road infrastructure.

The government put pressure on the rail transport company and made the rail transport company take action.

Rail infrastructure

This section presents the core statements on rail infrastructure.[151]

Most railways in Namibia were built in 1906, such as the section between Krantzberg and Otjiwarongo. Since the 1990s, this section has been reconstructed. Rail transport infrastructure was in good condition until the transition of the political and economic system in 1990. Since then, rail infrastructure has deteriorated. The state of rail transport infrastructure is poor. There is a significant backlog in maintenance. Speed limits are necessary in order to prevent derailments during hot weather. The speed of railway lines is low, only 30 kilometres per hour on average. Because of derailments, former rail transport customers decided against rail transport.

Only two railways are in use, the railway between Windhoek and Walvis Bay as well as Windhoek and Otjiwarongo. The railway between Swakopmund and Walvis Bay suffers from the harsh environment that requires frequent maintenance. The rail section between the port of Lüderitz and Keetmanshoop is not in good condition. The

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151   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-15-17	NA-16-03	NA-16-14	NA-16-15	NA-18-03	NA-18-04
NA-18-08	NA-18-09	NA-18-10	NA-18-11	NA-18-12	NA-18-13
NA-18-14	NA-18-15	NA-18-16	NA-18-17	NA-18-18	NA-18-19
NA-18-21	NA-18-22	NA-18-23	NA-19-16	NA-19-19	NA-21-22
NA-22-17	NA-23-19	NA-24-20	NA-25-09	NA-26-12	NA-26-13
NA-26-20	NA-26-32	NA-26-33	NA-26-35	NA-26-36	NA-27-01
NA-31-01	NA-31-02	NA-39-15	NA-39-16	NA-39-17	NA-39-18
NA-39-19	NA-39-20	NA-39-21			

section between Lüderitz and Aus has been reconstructed. However, it is still not in use because of shifting sand dunes on the track. The government is planning to build a tunnel to keep the track free from sand. The infrastructure is currently not sufficient to export bulk goods. The rail transport company conferred with manufacturing companies on exporting commodities from South Africa through the port of Lüderitz. However, first of all, the railways need to be improved as well as equipped with tunnels on a distance of 40 kilometres.

Other interviewees state that the new railway from Tsumeb to Oshikango as well as the existing railway to South Africa provide a fair performance.

The rail infrastructure is outdated. The rail infrastructure needs to be refurbished and upgraded. The gauge size is not suited to heavy loads. The insufficient maintenance contributes to the poor rail transport performance.

Since the political and economic transition, the government has not placed enough value on investment, recovery and maintenance of the rail network. Only very little new investment has been made in rail infrastructure. The only new investment in the rail infrastructure during the last years is the new track between Tsumeb and Oshakati. Because of its newness and permitted speed, the line in the north of Namibia to the border of Angola, as well as because of the capacity of the line in the south to South Africa, these two railway lines provide good rail transport performance.

The rail transport company is investing in rail infrastructure. Currently, the railways are being upgraded to an axle load of 18.5 tonnes and a speed of 100 kilometres per hour. A railway from Tsumeb to Oshakati has been built. The ongoing maintenance measures will allow the rail transport company to improve transport operations and reduce rail transport costs. Customers will acknowledge improvements by making their future transport mode decision for rail-friendly freight in favour of rail transport. This, in turn, will reduce the congestion on roads and, eventually, reduce the need for maintenance of roads.

An improper awarding of contract as well as lengthy expropriation processes for construction of railway lines caused delays and additional costs, for instance in the case of the railway from Tsumeb to Oshakati.

There are no cross-border links to neighbouring countries. The railways to the north and east do not cross the border. The railway in the north stops at Oshakati and Grootfontein, respectively. There is neither a railway from Oshakati in Namibia to the

border nor from Santa Clara in Angola to the border. In addition, Santa Clara is not connected to the railways in Angola. The railway line in the east stops at Gobabis; there is no link to Botswana. The lack of a railway link between Angola and Namibia results from the prolonged belonging of Namibia to South Africa as well as the alignment of Namibia towards South Africa. During the war in Angola, from the perspective of South Africa, there was a need to carry military equipment from South Africa through Namibia to Angola but at that time, there was no need for rail transport from Namibia to Botswana. Different gauge sizes among countries in southern Africa as well as a lack of cross-border links prevent cross-border rail transport in southern Africa. A railway between Namibia and Angola would improve cross-border transport.

Because of the high export and import volumes, there is a potential for cross-border rail transport to neighbouring countries such as Zambia and DR Congo. Along with dry ports for neighbouring countries, railway lines on the Walvis Bay-Ndola-Lubumbashi and on the Trans-Kalahari Corridor will route much more cargo through Namibia and allow the country to use its expanded port to capacity. For a railway to Zambia as well as for a railway to Botswana, feasibility studies have already been completed.

Because of the expected increase in traffic and freight volume, if Namibia wants to become a logistics hub, there is a need for a railway to Botswana. The railway from Grootfontein needs to be extended to Rundu, Livingstone, Lusaka as well as Harare.

The railway line to Zambia and DR Congo has always promised to be successful. Although the DR Congo has access to a seaport on its own territory, port users in the southern part of the country prefer to use the port of Walvis Bay. Before this railway line can become a reality, all participating governments need to approve this project. On both projects, the railway to Zambia and DR Congo as well as to Botswana, there is progress. Because of the high costs, there is a need for external funding.

Interviewees point out that it will take many years until a railway line between Grootfontein and Katima Mulilo is up and running. A railway line between Ndola and Walvis Bay would only be in place at a time when alternative corridors already exist. The country should have invested in a railway to Zambia and DR Congo long time ago. The country missed the right point in time for such a high scale, long-term investment. Since then, other modes of transport as well as other corridors have been established. Instead of investing in a railway that will not pay off anymore, the country should rather take a short-term view and seize their business by making use of the

existing modes of transport on the Walvis Bay-Ndola-Lubumbashi Corridor. Only certain railways should be extended to neighbouring countries to sustain the road infrastructure.

Other interviewees state that due to the high distances and established alternative transport modes, railway links to Zambia and Botswana are economically unfeasible. Before coal can be exported from Botswana through Namibia, a railway line with a distance of 2,300 kilometres would need to be constructed. Some alternative transport corridors already exist. For instance, coal from Botswana cannot only be exported through Namibia but through Mozambique and South Africa as well. In Namibia, the high volume and weight of coal exports would require a capable rail transport system.

The significant decrease of the price of coal has rendered the extension of the railway from Namibia to Botswana economically unfeasible. Three years ago, the global price of coal would have made the extension of a railway line to Botswana economically feasible and likely to be built. It is less cost-intensive to transport and export coal from Botswana through South Africa. An extension of the railway from Namibia to Botswana is only economically feasible if there are additional types of freight, such as containers. However, there are no signs that the necessary freight volumes will occour within the near to medium future.

Yet other interviewees plead that the economic feasibility of an extension of the railway from Grootfontein to Zambia and DR Congo mainly depends on the cargo volume that is exported to the west. For the east, to Asia, railways and ports in Tanzania and Mozambique are geographically better located. In addition, a redevelopment of the railway to Daressalam and Beira would be less costly than an extension of a railway from Namibia. On the Walvis Bay-Ndola-Lubumbashi Corridor, there is a risk that there is not enough freight on the return leg. Currently, the copper price does not allow high transport distances and costs.

Interviewees criticise that this railway project to Zambia is not driven by any private investors or development bank but only by the two benefitting countries, Namibia and Zambia. The only chance to attract any external investor is to build the railway in exchange for long-term exclusive mining and export rights of raw materials. Such an approach, however, stands in contrast to the economic development approach by resource-abundant countries. Whilst resource-abundant countries aim at increasing local added-value in order to create employment, transit and export countries aim at increasing export volumes at the expense of resource-abundant countries. Rail

transport is not a transport mode that favours manufactured goods and local value-add.

Instead of cross-border railways to Zambia and Botswana, the railway to Gobabis should be upgraded and dry ports should be built at Gobabis and Grootfontein in order to provide an intermodal interface between rail and road transport. Improvements in domestic rail transport would also lead to improvements in cross-border rail transport.

Only once the domestic transport performance meets the requirements of the market and there is a sufficient demand for cross-border rail transport, should an extension of the domestic rail infrastructure across the borders be considered. These interviewees do not completely exclude a cross-border railway to Botswana but only under the condition that there is an agreement that coal from Botswana is exlusively exported through Namibia.

However, because a new railway line may induce value and job creation in the hinterland, from an economic development point of view, an extension of the railway lines from Namibia to Botswana as well as to Zambia and DR Congo may be justifiable.

The government of Namibia is responsible for building that railway. However, a financing agreement has not been reached yet.

The government of Namibia prefers public and private investment into rail transport. The Walvis Bay Corridor Group is responsible for attracting private investors for rail transport. Attracting private investors is, however, a challenge. The government argues that because there is a lack of public funds, private investments are necessary. The private sector argues that investments in rail transport fall under the responsibility of the public sector. Because rail transport is cheaper, companies located near the railway would benefit. The Walvis Bay Corridor Group is trying to attract investors that would benefit from a railway and, thus, willing to invest.

The signalling as well as the automation of points and crossings needs to improve. The rail transport company already took actions, e.g. visits of shippers and visits to countries with advanced railway automation.

The coverage of the railway network needs to be improved.

Rolling stock

This section presents the core statements on rolling stock.[152]

In the past, deficiencies in rolling stock caused, among other factors, deterioration in rail transport performance. The fleet of locomotives is relatively old. The power of traction units is not sufficient for heavy loads. The state of rolling stock is poor. Faulty locomotives impede rail transport performance.

The lack of specialists in procurement led to a purchase of deficient locomotives and caused high costs. Newly purchased locomotives did not have enough traction power.

Deficiencies in rolling stock pose a risk to rail transport performance and consequently to the operations of the rail transport company's customers.

There are difficulties to get spare parts.

The rail transport company ordered new rolling stock to be delivered in 2016. The company ordered second hand locomotives from South Africa; these locomotives are expected to meet the requirements.

There is a need for automation in the rail transport system, including GPS tracking of locomotives and waggons. The rail transport company already took actions, e.g. visits of shippers and visits to countries with advanced railway automation.

Security and visibility

This section presents the core statements on security and visibility.[153]

There is a lack of visibility between railway stations. Security during transport is not ensured. Theft during transport impedes rail transport performance. Because of their high value and high exposure to theft during transport, rail transport is not a modal option for manufactured goods. Other interviewees oppose that there is almost no

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152   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| NA-15-14 | NA-16-18 | NA-18-02 | NA-18-03 | NA-18-05 | NA-18-09 |
| NA-18-21 | NA-18-22 | NA-18-23 | NA-21-20 | NA-21-22 | NA-25-05 |

153   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| NA-15-16 | NA-18-18 | NA-18-22 | NA-22-19 | NA-28-13 | NA-39-08 |

theft during rail transport in Namibia. In general, security during transport is highest in Namibia among SADC countries.

As indicated earlier, the tracking of locomotives and waggons needs to improve. The rail transport company already took actions, such as visits of shippers and visits to countries with advanced railway automation.

Management and organisation

This section presents the core statements on management and organisation.[154]

As stated earlier, there have been attempts to improve rail transport performance; however, all attemps failed. A lack of qualification of decision makers at the rail transport company as well as too much reliance on personal relations led to the failure of attempts.

Since the change of the political and economic system, poor management has led to a deterioration of the rail transport performance.

There is a lack of continuity in business strategy and leadership at the rail transport company. There were frequent changes in management. Poor management performance, lack of accountability as well as a risk aversion contribute to poor rail transport performance.

The rail transport company only took orders but did not do anything to keep existing customers and find new customers.

Some interviewees state that it lacks a feasible plan and actions to improve the rail transport system. Other interviewees point out that the rail transport company is currently trying to define the future role of rail transport in the supply chain in Namibia. Yet other interviewees state that the management of the rail transport company has good strategies and plans; however, the employees do not have the necessary motivation and willingness to support their employer in putting these into practice. The attitude towards work differs between Namibia and South Africa. Many South Africans have the necessary willingness and motivation to help their employer to strive. Despite

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154   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-16-20	NA-18-06	NA-18-09	NA-19-09	NA-19-16	NA-19-17
NA-19-19	NA-20-23	NA-21-20	NA-21-21	NA-21-22	NA-22-08
NA-22-19	NA-22-20	NA-26-27	NA-26-30	NA-27-09	NA-27-10

good strategies and plans, deficiencies in the qualification of the workforce of the rail transport company and a lack of public funds to take actions impede improvements in rail transport performance.

Since the port company performs very well, it should lead or have a share in management decisions of the rail transport company. Although the rail transport company and the port company of Namibia are both run as public enterprises, the two businesses operate under very different conditions. Whilst the port is subject to international integration and relies on compliance with international standards, the rail transport system is not subject to international integration and only relies on domestic standards in Namibia. If rail transport had been exposed to the same conditions as the port, it would have achieved a similar level of development and performance. Other interviewees state that rail transport has never been and is still not subject to the same critical factors as the port.

Yet other interviewees state that the good management and importance of the ports to the economy explain the good performance of ports in Namibia.

Education and workforce

This section presents the core statements on education and workforce.[155]

After the change of the political and economic system in Namibia, many skilled people left the rail transport sector. It took about 20 years to fill this gap with local graduates.

A lack of a sufficient number of engineers contributes to the insufficient maintenance of the railways. Too few people run through engineering programmes at university.

There are deficiencies in the qualification of the workforce at the rail transport company.

There are no specific railway-trained engineers; there is no specific training for railway engineers. There is no specific training for railway management and operations. Currently, a training centre for rail transport does not exist in Namibia. There is a need for specific rail training.

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155   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-18-26	NA-19-16	NA-19-18	NA-19-20	NA-27-10	

There is a need for engineers and train drivers. It takes too long to educate train drivers. Shorter lengths of education would release train drivers earlier to the market.

The envisoned improvements in rail transport can only be achieved with an adequately qualified workforce.

There is progress in the provision of logistics professionals.

Since deficiencies in education and workforce do not only affect rail transport, but the other supply chain domains as well, a comprehensive analysis of deficiencies in education and workforce follows in section 6.3.2.5 on the supply chain system of Namibia.

Competition

This section presents the core statements on competition.[156]

There is a lack of competition in rail transport in Namibia. The rail transport company is significantly subsidised by the government each year. Instead of public operation, private companies should run rail transport operations and infrastructure.

The costs of rail transport are high. Other interviewees state that rail freight rates are good.

Because lorries from South Africa need to return from Namibia to South Africa in any case and are often empty, road transport companies are able to offer return legs at low freight rates. Because railways may not take the linear distance, rail transport routes may be much longer than road transport routes. Consequently, even rail-friendly freight may be carried more cost-efficiently by road transport. These two facts impede the ability of rail transport in Namibia to compete successfully against road transport.

Cross-cutting issues

This section presents the core statements on cross-cutting issues.[157]

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156   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| NA-18-20 | NA-21-19 | NA-27-06 | NA-39-15 | | |

157   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-15-12	NA-18-24	NA-18-25	NA-19-11	NA-19-21	NA-24-21
NA-24-22	NA-24-23	NA-24-24	NA-26-29	NA-26-34	NA-26-35
NA-39-15	NA-39-16	NA-39-23	NA-39-24	NA-39-25	

Private companies should run railway transport operations and carry out the maintenance of rail infrastructure. Privatisation of selected parts of the logistics chain could provide value to the country; the rail transport company serves to create jobs.

As indicated earlier, the government of Namibia prefers public and private investment in the rail transport system. Attracting private investors is, however, a challenge. The government argues that because there is a lack of public funds, private investments are necessary. Because rail transport is cheaper, companies located near the railway would benefit. The Walvis Bay Corridor Group is trying to attract investors that would benefit from a railway and, thus, would be willing to invest. The private sector argues that investments in rail transport fall under the responsibility of the public sector.

To reach an agreement in customs, border posts, and railway issues at governmental level on cross-border railway projects, Namibia, Zambia and DR Congo as well as Namibia and Botswana established organisations consisting of public and private stakeholders.

There are doubts as to whether there is enough freight volume to operate the rail transport system profitably. Enough demand for rail transport exists only on specific lines and only for high volume and high weight goods. Other interviewees state that because of the lack of economic viability, the private sector will not be interested in the rail transport system. Yet other interviewees oppose that there is demand for rail transport in all parts of the country. Once the port expansion is complete, the freight volume will exceed the capacity of road transport and there will be a need for more intensive rail transport in Namibia. For the logistics hub concept to materialise there is a need for significant improvement in rail transport in Namibia. The availability of high rail transport performance decides on the success of the logistics hub concept.

Provided that the railway system remains under public operation and control, the responsibility to improve the rail transport system lies with the ministry of transport.

The Walvis Bay Corridor Group along with the Ministry of Works and Transport and Spatial Development Initiatives are responsible to push the logistics hub strategy and attract investment in rail transport and transhipment centre infrastructure.

Improvements in rail transport performance should not be done against the background of the logistics hub, but rather to reduce the burden on road infrastructure and support domestic transport. Before planning to extend the rail network to neighbouring countries, domestic transport performance should be improved. The volume of bulk

goods on rail should increase. Irrespective of the need for higher rail transport performance to realise the logistics hub, an increase in rail transport performance is necessary to improve domestic transport performance.

To realise the necessary improvements of the rail transport system, significant investment in rail infrastructure, rolling stock as well as the workforce of the rail transport company are necessary.

There are a number of obstacles to improvements in rail transport performance in Namibia:

The road transport industry is not in favour of a capable rail transport system, since the industry benefits from low rail transport performance. As stated earlier, poor rail transport performance contributes to the high market share of road transport. In addition, there is rivalry among transport associations in Namibia.

The unwillingness of the government to make decisions that do not appeal to everyone but are necessary to improve the rail transport system represent an obstacle to improvements in the rail transport system. Measures that would increase rail transport performance but come at the expense of the workforce do not obtain a political majority.

The lack of public funds represents or may represent an obstacle to improvements in rail transport. The government is responsible for providing financial guarantees, financial assistance as well as finance through issuance of public sector bonds. The government should prioritise funds to investments that provide a direct benefit to the economy, for instance to the transport system and in particular to the rail transport system.

The Moroccan rail transport system provides a good example that Namibia could look at and learn from.

Importance and performance of rail transport network attributes

Figure 6-11 illustrates the average relative importance values[158] of rail transport network attributes across countries as well as the average performance values[159] of these attributes in Namibia. To recap, four respondents evaluated the importance of rail transport network attributes. Only one respondent rated the performance of rail transport network attributes in Namibia. Due to the low number of respondents, the questionnaire and the personal interview results should be analysed coherently in order to provide a meaningful picture.

To give an overview, the respondent assigned a fair to poor rating to rail transport performance in Namibia.[160] The respondent assigned a poor rating to equipment and facilities, a fair to poor rating to infrastructure and transport operations as well as a good to fair rating to public policies and services – in ascending order. Transhipment centres have not been rated. With this overview in mind, this section now presents the details by attribute.

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158   For ease of interpretation and analysis, the average relative importance values have been translated into verbal expressions, by means of the following scheme: standard deviation (σ) = 9.0 %; mean (μ) = 20 %; μ - 1σ = 11.0 %; μ + 1σ = 29.0 %

μ + 1σ	<	x	≤	100 %	High
μ		<	x	≤	μ + 1σ	Medium to high
μ - 1σ	≤	x	<	μ	Medium to low
0 %		≤	x	<	μ - 1σ	Low

159   For ease of interpretation and analysis, the average degree of agreement values have been translated into verbal expressions, by means of the following scheme:

1.0 – 2.4	Strong agreement	Good
2.5 – 3.4	Slight agreement	Good to fair
3.5 – 4.4	Slight disagreement	Fair to poor
4.5 – 6.0	Strong disagreement	Poor

160   The mean value and standard deviation across all five attributes of rail transport network performance in Namibia is 4.0 and 0.8, respectively.

Figure 6-11: Importance and Performance – Rail Transport Namibia
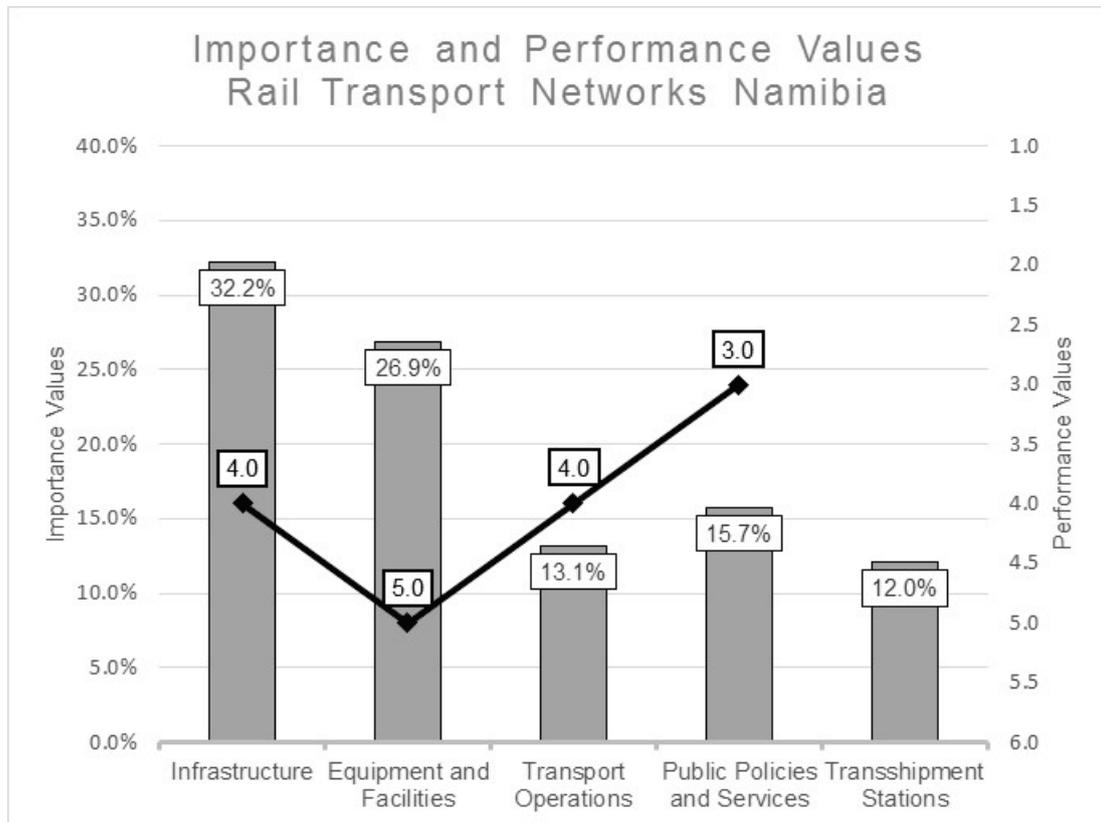
First, the "equal weight" procedure is applied. This procedure yields the following picture and leads to the following conclusions.[161]

Respondents assigned a high importance (32.2 %) as well as a fair to poor performance (4.0) to infrastructure. The high importance argues for a much higher than fair to poor performance. Thus, the infrastructure seems to represent a constraint to rail transport performance in Namibia.

Respondents assigned a medium to high importance (26.9 %) as well as a poor performance (5.0) to equipment and facilities. The medium to high importance argues for a much higher than poor performance. Thus, the equipment and facilities seem to represent a constraint to rail transport performance in Namibia.

Respondents assigned a medium to low importance (13.1 %) as well as a fair to poor performance (4.0) to transport operations. The medium to low importance is in line

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161 The "equal weight" procedure gives an equal weight to the importance and performance component, as described in section 6.3.1.1 on page 158.

with the fair to poor performance. Thus, the transport operations do not seem to represent a constraint to rail transport performance in Namibia.

Respondents assigned a medium to low importance (15.7 %) as well as a good to fair performance (3.0) to public policies and services. The medium to low importance would justify an even lower than good to fair performance. Thus, the public policies and services do not seem to represent a constraint to rail transport performance.

Respondents did not provide information on the transhipment centre attribute; hence, there is no data on attribute performance to contrast with attribute importance values.

Second, the "higher weight towards performance" procedure is applied.[162] This procedure yields the following picture and leads to the following conclusions: Equipment and facilities received the lowest performance value. Thus, equipment and facilities seem to represent a constraint to rail transport performance in Namibia.

Consequently, all in all, infrastructure as well as equipment and facilities seem to represent constraints to rail transport performance in Namibia.

6.3.2.4 Manufacturing Locations

The statements on manufacturing locations are sorted according to the following sections, namely, manufacturing industry, transport system, electricity supply, water supply, supply of input goods and services, education and workforce as well as cross-cutting issues. Because none of the respondents completed the online questionnaire on manufacturing location performance of Namibia, combined importance and performance attribute evaluations of manufacturing location performance cannot be presented.

Manufacturing industry

This section presents the core statements on the manufacturing industry.[163]

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162   Provided that an attribute is important, irrespective of the actual level of importance, "higher weight towards performance" procedure gives a higher weight to the performance component, as described in section 6.3.1.1 on page 159.

163   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-13-03	NA-15-07	NA-15-09	NA-15-18	NA-15-19	NA-15-20
NA-16-09	NA-20-24	NA-25-01	NA-25-08	NA-25-09	NA-25-10
NA-25-11	NA-25-12	NA-26-37	NA-26-38	NA-27-03	NA-27-11
NA-28-08	NA-28-14				

The volume of local manufacturing is low in Namibia. Even mining goods are exported unprocessed from Namibia. The country relies on imports from abroad. Instead of importing, the country should produce more goods locally.

Some interviewees suggest attracting more manufacturing plants in Namibia. That would allow a reduction of costs of goods in Namibia. Local industrial production should increase in Namibia in order to strengthen the economy. If local production increases, the supply chain competitiveness would increase. To reduce supply chain costs in Namibia, interviewees suggest shifting manufacturing or assembly plants for local demand from South Africa to Namibia. In general, like South Africa, Namibia should produce more goods locally and thereby reduce the dependence on other countries. The self-sufficiency of the economy of South Africa is a good example that Namibia could look at and learn from.

Other interviewees state that the domestic market and the economic relevance of Namibia is small compared to other countries in southern Africa. The domestic market is too small to justify local production in Namibia. The country does not have the capability to accommodate a manufacturing industry.

Other interviewees state that the necessary environment to run manufacturing locations is available in Windhoek; the location is good for manufacturing. The distance to markets is good; road and rail transport provide the necessary transport performance. The necessary workforce is available. Companies have aligned their businesses and supporting environment to the manufacturing location.

Despite the non-existence of a significant manufacturing and export industry, the country wants to become a logistics hub and manufacturing location. Well-qualified expatriates and a better education system are necessary to put this plan into action within reasonable time. However, the unfavourable attitude of the government towards expatriates represents an obstacle.

The government has already identified manufacturing industries that the country should focus on. There are no actions yet. The government is still busy identifying the factors that could encourage companies to locate in Namibia. First, the country needs to convince companies to use Namibia as a gateway to southern Africa. Second, this will then help to identify relevant industries and to attract manufacturing companies. Once a logistics hub is in place, the Walvis Bay Corridor Group will focus on promoting the country as a manufacturing location for certain industries.

Other interviewees criticise that the logistics hub concept is not driven by the private sector but only by the public sector. There have already been attempts by the government to locate economic centres in underdeveloped areas. However, these attempts failed. Instead of the public sector, the private sector will decide where to set up their locations. The government should place more value on the preferences of the private sector instead of trying to indicate to the private sector where to put its locations.

The country has a well performing fish industry. Because the fish industry in Namibia complies with international regulation standards, processing and packaging of fish is attractive for both domestic and foreign companies. However, once the oil price increases again, fishing in Namibia will become unprofitable for foreign fishing companies.

Transport system

This section presents the core statements on the transport system.[164]

Despite deficiencies in rail transport, the existing rail transport system meets the requirements of companies. Preventive operational measures allow companies to balance supply risks. Safety stocks allow companies to balance fluctuations in supply of input goods and services. Nonetheless, further deteriorations in rail transport performance pose a risk to the operations of companies. The deterioration of the rail transport system is an internal threat, which can be alleviated or even eliminated.

As stated earlier, because of low transport performance, rail transport does not lend itself for transport of manufactured goods.

Electricity supply

This section presents the core statements on electricity supply.[165]

There are deficiencies in supply of electricity. Namibia is dependent on electricity supply from South Africa.

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164   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-25-09	NA-25-14				

165   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-20-24	NA-25-11	NA-25-14	NA-25-16		

Own power supply allows companies to balance fluctuations in supply with electricity. In contrast to the scarcity of water, deficiencies in electricity supply can be eliminated.

Because of deficiencies in electricity supply and dependency on supply from South Africa, the country will not be able to establish a considerable manufacturing industry.

Since deficiencies in electricity supply do not only affect manufacturing locations, but the other supply chain domains as well, a comprehensive analysis of deficiencies in electricity supply follows in section 6.3.2.5 on the supply chain system of Namibia.

Water supply

This section presents the core statements on water supply.[166]

There are deficiencies in water supply in Namibia. Water is a scarce resource at the country's main economic centre, Windhoek.

The current drought negatively affects agricultural as well as the construction industry.

The scarcity of water is not new to the country; but now there is an urgent need to set up a plan to alleviate the scarcity of water. Further deterioration in water supply poses a risk to the operations of companies. The scarcity of water speaks against water intensive manufacturing businesses.

The government is responsible for ensuring water supply. The city of Windhoek and the national water company set up a plan to limit water consumption by charging a disproportional premium above a certain threshold. However, this should have been done much earlier.

Whilst in road infrastructure there are public strategies and actions, in water supply there is a lack of strategies and actions. A short-term plan exists; however, it lacks a strategy to deal with the scarcity of water.

In contrast to deficiencies in the transport system and electricity supply, deficiencies in supply with water is an external threat whose cause cannot be eliminated.

Because of the scarcity of water at the main economic centre, the country will not be able to establish a considerable manufacturing industry.

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166   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-20-24	NA-23-02	NA-25-08	NA-25-14	NA-25-16	NA-25-17
NA-25-18	NA-25-19				

Because deficiencies in water supply do not only affect manufacturing locations, but the other supply chain domains as well, a comprehensive analysis of deficiencies in water supply follows in section 6.3.2.5 on the supply chain system of Namibia.

Supply of input goods and services

This section presents the core statements on supply of input goods and services.[167]

The location is far away from suppliers. Input materials are sourced from Europe and South Africa. Services to maintain manufacturing equipment are imported as well.

Currently, some suppliers are setting up manufacturing locations in Namibia.

Good planning and service level agreements as well as preventive actions, such as adequate safety stocks, allow companies to balance deficiencies in supply of goods and services.

Education and workforce

This section presents the core statements on education and workforce.[168]

It lacks specialised local knowledge in Namibia.

To become a logistics hub and industrialised country, the country needs to establish the necessary knowledge base. This can only be achieved by means of knowledgable and experienced expatriates.

As stated earlier, other inteviewees state that the necessary workforce is available.

Because deficiencies in education and workforce do not only affect manufacturing locations, but the other supply chain domains as well, a comprehensive analysis of deficiencies in education and workforce follows in section 6.3.2.5 on the supply chain system of Namibia.

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167   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-15-01	NA-25-10	NA-25-15			

168   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-25-12	NA-26-37	NA-27-12			

Cross-cutting issues

This section presents the core statements on cross-cutting issues.[169]

The government should provide loans or land to small companies that are expected to have sustainable success. Small companies often do not have the financial resources to meet the requirements of potential customers, such as regulatory requirements.

6.3.2.5 Supply Chain System

The statements on the supply chain system are sorted according to the following sections, namely, stage of development of the economy, education and workforce, local currency, electricity supply, water supply, public authority performance, public regulation, customs system as well as supply chain development.

Stage of development of the economy

This section presents the core statements on the stage of development of the economy.[170]

Because of the late independence of Namibia, there are shortfalls in some factors that determine the stage of development of the economy and supply chain system. Whilst some countries have achieved a lower stage of development, such as Angola and DR Congo, other countries have achieved a higher stage of development of their economies, such as South Africa.

Because of shortfalls in the stage of development of the economy, the country is still in the process of establishing the foundation of the economy and of becoming more self-sufficient. The economy of Namibia is highly dependent on imports, for instance from South Africa. Namibia always used to import goods from South Africa. Since the economy highly depends on the economy of South Africa, the economic situation in

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169   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-27-12					

170   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-15-01	NA-15-09	NA-16-01	NA-20-18	NA-21-01	NA-25-03
NA-26-01	NA-26-04	NA-27-02	NA-28-01	NA-28-10	NA-28-12
NA-39-04	NA-39-08				

South Africa decides on the economic situation in Namibia. An economic downturn in South Africa also affects Namibia.

The logistics system in Namibia is different from the logistics system in South Africa. The freight volume that goes through Namibia is much lower than volume through South Africa. The trading system is less mature in Namibia than in South Africa. All in all, the logistics system is less developed in Namibia than in South Africa. The performance of the economy of South Africa is much higher than of Namibia. Nonetheless, interviewees plead that the logistics system is well developed in Namibia.

Interviewees state that many people did not even receive basic education and a democratic political system and political participation is still new to many people. The low experience with inclusive political and economic institutions still poses a risk to the development of a virtuous circle in democracy. Other interviewees state, however, that the political system is stable. The stability of the political system and well-working democratic system contribute to the good logistics performance of Namibia.

Education and workforce

This section presents the core statements on education and workforce.[171]

Until the change of the political and economic system, the logistics system of Namibia worked well. The lay-off of knowledgable people has, however, led to a loss of knowledge. These people should have been part of the transformation to sustain the achieved level of logistics performance.

People in the logistics and manufacturing industry are often not sufficiently educated and trained to provide the necessary performance. Often, their knowledge does not conform to the state of development of supply chains today. In times like these, when import costs are high and the business volume is low, companies would normally apply advanced supply mechanisms to reduce working capital and counterbalance import costs. However, insufficient qualification of people keeps companies from running sophisticated, advanced supply mechanisms. Other interviewees state that there is a

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171   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-15-06	NA-16-01	NA-16-04	NA-16-11	NA-19-07	NA-19-08
NA-19-10	NA-19-14	NA-23-02	NA-25-12	NA-26-08	NA-26-09
NA-26-21	NA-26-22	NA-26-37	NA-27-01		

lack of skills in the logistics industry; it lacks the ability to think coherently along logistics processes and supply chains. It should be kept in mind that other interviewees state that the necessary workforce to run manufacturing locations is still available.

Many people did not receive basic education.

In the past, education and training of logistics professionals did not take place in Namibia. There is a demand for logistics professionals. It is only recently that logistics professionals have been educated in Namibia.

The public sector does not invest enough funds into public education. Much higher funds are necessary to manage the shift from a labour to a knowledge-intensive economy. Kenya for instance invests one percent of its GDP in education – that is a good example for Namibia to look at and learn from.

Interviewees state that there are cultural differences between Namibia and South Africa. The South African population, i.e. the workforce, is more forward thinking. Their population structure consists of more ethnical groups.

The non-white workforce still faces difficulties in participating in business with equal rights. In general, both in the private and public sector, graduates face difficulties in the labour market. That represents an obstacle to the development of the supply chain system in Namibia.

A lack of qualifications of the workforce respresents an obstacle to the development of the economy and supply chain system in Namibia.

Because the short to medium-term demand for qualified workforce to put the logistics hub concept into practice cannot only be provided by Namibia, qualified expatriates are needed. However, the government is not in favour of temporary external support from expatriates. The government needs to change its attitude towards knowledgeable and experienced expatriates to allow the country to become a logistics hub. Younger Namibians will be better educated and will be better informed; they will find ways to sustainably strengthen the economy and supply chain system of Namibia.

Education and qualification of people needs to be improved.

Employment according to qualification needs to be improved.

Local currency

This section presents the core statements on the local currency.[172]

Currently, the weakness of the currency of Namibia against major international currencies increases the costs of imports in Namibia.

Companies in Namibia react to high overseas import costs either by shifting their sources of supply to South Africa or by reducing import and production volumes.

Because of the high importance of imports to the own economy as well as to the logistics system, decreases in import volume reduce transit cargo and business volume in Namibia.

The local currency is expected to further devalue in the future.

Electricity supply

This section presents the core statements on electricity supply.[173]

It has already been stated that there are deficiencies in supply of electricity. Fluctuation in supply of electricity require companies to maintain own sources of supply. The country is dependent on electricity supply from South Africa. In the past, South Africa had difficulties in ensuring its own electricity supply.

There is a backlog in the state of electricity supply infrastructure.

Water supply

This section presents the core statements on water supply.[174]

There is a backog in the state of water supply infrastructure.

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172   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-16-02	NA-23-01				

173   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-26-07					

174   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-23-01	NA-26-06	NA-26-07			

Aridness and droughts are not new – the country is a semi-desert. Since independence, there has been no adequate planning to eliminate or alleviate the scarcity of water. Today, the drought creates significant problems for the economy.

Public authority performance

This section presents the core statements on public authority performance.[175]

As part of the political and economic transition in Namibia, high-level staff at public authorities have been replaced without consideration of their qualifications and a need for a smooth hand-over. The deficient hand-over to new staff has deteriorated the performance of public authorities. These people should have been part of the transformation in order to maintain the performance.

With regard to road transport, other interviewees oppose that the good hand-over is one of the factors that explain today's high cross-border road transport performance in Namibia.

Yet other interviewees state that public authorities are run by the same people who contributed to the change of the political and economic system. These people are, however, not sufficiently educated to develop the economy in the future. Instead of hiring based on qualifications, many people have made their way into the public sector based on personal connections. These people will try to keep qualified people away in order to defend their position. Because younger Namibians are better educated, more open-minded and have more information at hand, they will have it easier to find out what is necessary to strengthen their economy.

There is a lack of a well-founded and reasonable decision making process in the public sector. The public sector, in particular the ministries and agencies, need to bring in logistics professionals to ensure a sound development of the logistics industry. More logistics professionals should be in charge at ministries and agencies in order to improve the performance in this sector.

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175   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-15-02	NA-15-03	NA-15-04	NA-15-05	NA-15-06	NA-16-03
NA-19-10	NA-19-12	NA-19-13	NA-19-14	NA-19-15	NA-23-18
NA-26-09	NA-26-22				

New staff with new ideas need to be employed at public authorities. Public authorities should enter into partnerships with local universities. On the one hand, partnerships would allow students to gain experience; on the other hand, they would provide public authorities with new ideas.

However, graduates face difficulties on the labour market, both with regard to the public as well as private sector. There are still barriers for non-white people to participate in business with equal rights.

The qualification of employees at public authorities needs to improve in order to attract higher freight volumes through Namibia and contribute to improvements in supply chain performance. Deficiencies in qualification of public authority officials impede supply chain performance.

The attitude of public authorities towards performance delivery needs to be improved.

The government and the ministry of education are responsible for making up a plan to improve public authority performance.

Both the universities and public authorities are responsible for increasing collaboration.

Public regulation

This section presents the core statements on public regulation.[176]

The regulatory framework has weaknesses.

The public sector excessively interferes in economically critical factors. Although the affirmative action programme is politically justifiable, it puts foreign investors off and eventually harms the economy. Other interviewees state that the affirmative action programme is justifiable; however, it impedes the development of the economy. Other interviewees state that the regulatory environment, e.g. New Equitable Economic Empowerment Framework, causes concerns about the ease of doing business in Namibia. Companies are not in favour of this programme. There is a need to monitor the regulatory environment. In the worst-case, companies need to reconsider doing business in Namibia.

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176 Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-15-08	NA-16-04	NA-16-05	NA-20-03	NA-26-10	

The elimination of deficiencies of the affirmative action programme is the responsibility of the public sector. The government should reconsider a development of the affirmative action programme. Once the government has provided the necessary regulation, private sector actions could be examined.

An example of good governance can be found in Botswana. The currency of Botswana is strong, the level of corruption is low in Botswana and the government performs well. The governance of Botswana is a good example at which Namibia should look and learn from.

Customs system

This section presents the core statements on the customs system.[177]

The performance of customs processes in Namibia is lower than in South Africa; the performance in Namibia is, however, higher than in other countries on the African continent.

The fact that online documents cannot legally be accepted makes the submission of paper-based documents necessary. Customs clearing documentation processes still heavily rely on physical documents and tasks. Customs document flows are fully digitised in South Africa. In the adoption of new technology, Namibia is always a bit behind South Africa. Digitisation of customs clearing processes should be pushed ahead. There is a need for higher reliance on electronic documents and processes.

There is progress in customs processes. Last year, a new customs IT system was introduced. Single windows should be introduced. There are plans to introduce a single window. A one-stop border post is being implemented at the border to Botswana. However, in contrast to Namibia, a single window has already been introduced in Mozambique.

The backlog results from an insufficient implementation speed. Speed of implementation is not sufficient. Differences in the customs performance between Namibia and South Africa result from differences in economic size between the two countries. The

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177   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-16-03	NA-20-08	NA-20-16	NA-20-21	NA-21-08	NA-21-09
NA-21-10	NA-21-11	NA-23-05	NA-23-08	NA-23-09	NA-23-16
NA-24-19	NA-26-10	NA-26-18	NA-28-06	NA-28-10	NA-39-01

higher volumes and higher stage of development favour an earlier adoption of new technologies in South Africa.

The availability of sufficiently qualified people in customs and cross-border operations is not ensured in all regions of the country and causes cumbersome processes. The education and training of customs staff needs to improve.

As stated earlier, the customs authority should regard itself as a service provider to port customers.

A lack of knowledge and experience as well as ignorance of customers, especially from foreign countries, causes additional time and costs of customs processes.

The customs clearing system needs to be improved.

The education and training of customs staff needs to be improved.

As stated earlier, there is a need for improvements in customs from the port to the border of neighbouring countries. Tanzania provides an example of improvements in customs from the port to neighbouring countries. Customs clearing is done at the port of Daressalam for the entire import process.

The supply of electricity needs to be improved at border posts.

The customs IT system needs to be improved.

The customs system of South Africa is a good example for Namibia to look at and learn from. The development of customs clearing processes in Namibia should follow South Africa.

Because the customs authority is a public agency under the ministry of finance, the responsibility for improvements in customs services lies with the public sector. The responsibility to improve customs processes lies with the customs authority. The governments needs to ensure that the customs system facilitates trade.

Supply chain development

This section presents the core statements on the supply chain development.[178]

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178   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| NA-16-01 | NA-16-02 | NA-16-05 | NA-16-06 | NA-20-17 | NA-21-02 |
| NA-22-01 | NA-22-18 | NA-23-01 | NA-24-18 | NA-25-01 | NA-25-02 |

Some interviewees observe and expect a deterioration in supply chain performance in Namibia. The handling of daily business is becoming more cumbersome and time intensive. Doing business will become more difficult. Because of the various weaknesses and needs for improvements, the economic performance and supply chain performance will deteriorate within the next ten years.

Some interviewees are concerned about the prospect of success of the logistics hub concept.

Since a number of countries in southern Africa are planning to establish logistics hubs on their territory, the success of a logistics hub concept in Namibia hinges on whether other countries are able to successfully build up their own logistics hubs. If they succeed, the logistics hub in Namibia will face significant competition. Only if they fail, will companies continue to make use of a logistics hub in Namibia. The Walvis Bay Corridor will only be an option as long as there are no better alternatives. Other interviewees oppose that although there is competition among gateways and corridors, the business volume is large enough to provide each with a sufficient share.

The domestic market is small in Namibia. If the other countries succeed in building up their own logistics hubs, because of the larger domestic and adjacent market, many companies would rather choose the other gateways.

Distances to neighbouring countries are high. Even if significant increases in efficiency can be achieved, the long distances to the neighbouring countries will put the logistics hub at a disadvantage and require cost compensation.

Because of the proximity to a larger market, instead of investing in Namibia, many companies would rather wait until logistics hubs in neighbouring countries are put in place.

Against these arguments, other interviewees oppose that the country is a good location from where to control business in other African countries. Many companies control their African business out of Namibia. Yet other interviewees point out that the

NA-25-03	NA-26-02	NA-26-11	NA-26-15	NA-26-16	NA-26-17
NA-26-19	NA-26-20	NA-26-21	NA-26-22	NA-26-25	NA-26-37
NA-27-07	NA-28-03	NA-28-05	NA-28-09	NA-28-11	NA-39-05
NA-39-07	NA-39-08	NA-39-10	NA-39-11	NA-39-25	

logistics hub strategy particularly aims at making the country the benchmark in terms of efficiency, safety, security and ease of doing business in southern Africa.

There is a huge gap between the current state and the envisioned state of supply chain development that needs to be overcome in order to establish a logistics hub in Namibia. Before the logistics hub concept can become a reality, a number of factors need to be put into practice. Moreover, many factors that need to be improved to overcome the gap are externally determined. Other interviewees state that because the realisation of the logistics hub concept rests on too many external factors, the logistics hub concept is economically not feasible.

Interviewees remark that the logistics hub concept does not result from the request of neighbouring countries for additional transhipment and transport capacity. Rather, the logistics hub concept results from the willingness of the public sector in Namibia to provide capacity in advance, wait for cargo to come and route it through Namibia. The necessary degree of commitment of neighbouring countries to make use of a logistics hub in Namibia does not exist. The logistics hub concept is not driven by market demand but rather by a public decision. The market fundamentals do not justify massive, long-term strategies. If the market fundamentals would justify it, the private sector would already have taken actions. Other interviewees oppose that it is particularly the positive expectation about the future development of cargo volume in southern Africa that explains investment into the expansion of the port of Walvis Bay.

Because of the inability to plan as well as the resulting uncertainty, a long-term strategy is inappropriate. Instead of large-scale strategies and plans, gradual plans, actions and achievements should substantiate the role of a logistics hub in Namibia. Potential users of a logistics hub should not be attracted by visionary strategies, but rather by gradual plans, actions and achievements. It should be borne in mind that transport corridors in Namibia did not evolve from large-scale strategies but rather from gradual, market-oriented decisions, plans and actions. Whilst the public sector pursues high-scale, long-term plans, the private sectors plans and acts based on market fundamentals. The private sector is better suited to develop the logistics industry.

Although the Walvis Bay Corridor Group is marketing the port of Walvis Bay very well, it is now entering into freight brokerage business – an area pertaining to the private sector. The private sector is better suited to develop the industry in a market-oriented manner. Other interviewees oppose that private companies are part of the association that strives to develop the port of Walvis Bay and the hinterland transport corridors.

The public sector is only able to pursue these risky long-term strategies because they will not bear the consequences if the logistics hub concept does not become a reality. Other interviewees oppose that the Walvis Bay Corridor Group is marketing the country well as a logistics hub and transit country. It is likely that the logistics hub will become a reality in Namibia.

Interviewees point out that they do not underestimate the importance of the logistics industry in Namibia and their achievements in positioning the country as a gateway location. However, the chosen approach to become a logistics hub excessively relies on future expectations. Instead of pursuing a strategy that depends on too many external factors, the economy should gradually strengthen the logistics system and at the same time strengthen sectors in which the economy already has a comparative competitive advantage. To sustain the good state of the road infrastructure, certain railway lines should be extended.

The logistics concept is likely to become a reality. Albeit at a lower pace than expected, the logistics hub concept is taking shape. Cargo volumes increased and companies are setting up locations in Namibia. However, because of the poor economic situation in southern African countries as well as in a number of other countries around the world, the realisation of the logistics hub is not advancing as fast as expected.

Two main obstacles may impede the realisation of the logistics hub strategy. First, in order to absorb the traffic and freight volume increase and to limit the burden on road infrastructure, there is a need for railways to neighbouring countries. Thus, the realisation of the logistics hub concept rests upon the realisation of cross-border rail links. Second, because of soft factors, decision makers stick to their traditional transport corridors. That is difficult to change. The unwillingness of decision makers to change their preferred port and transport corridor represents an obstacle to the realisation of the logistics hub.

In contrast to interviewees who are concerned about the development of the supply chain system, other interviewees do not see and expect any deterioration in supply chain performance or rather expect a sustainment or even improvement in supply chain performance in Namibia. Other interviewees state that behind the background of all the ongoing actions for improvement, the economic performance of the country is going to improve; however, at a different level than South Africa. Because of the high awareness of the importance of the logistics hub concept to the country and the

high commitment of the stakeholders to increase the logistics performance, there are no concerns about a deterioration of logistics performance in Namibia.

The various plans and actions for improvement, such as the logistics hub concept, the enhancement of the ports and road transport system as well as the education of logistics professionals at universities, speak in favour of an increase in supply chain performance. However, a drawback is the lack of serious plans and actions to improve the rail transport system.

The weaknesses of the transport system in Namibia are discussed and addressed. The importance of logistics to Namibia is recognised. There is progress in the transport system.

If the country continues to provide very good port and corridor performance that allows its customers to run supply chains at high performance levels, deteriorations in competitive position against other countries are not expected.

The country is politically and economically stable; apart from issues related to history and discrimination, the population behaves cooperatively. The government is performing well; the country is one of the largest non-oil producers on the African continent. These reasons speak in favour of improvements in economic and supply chain performance. However, the economic performance of Namibia will remain below the economic performance of South Africa.

The Walvis Bay Corridor Group along with the Ministry of Works and Transport and Spatial Development Initiatives are responsible for pushing the logistics hub strategy. The ministry of transport is responsible for improving the public part of the transport system. There is, however, a lack of a well-founded and reasonable decision-making process in the public sector. Other interviewees state that the government is responsible for sorting out the various weaknesses in rail transport, customs, public sector service delivery, education and qualification and employment according to qualification as well as affirmative action programme. However, the government does not feel responsible for taking actions for improvement. A perception that the government is responsible for searching for and taking actions for improvement does not prevail in Namibia; this perception is a European view of the role and responsibility of the public sector. Similarly, other interviewees state that the country relies too much on waiting for things to change automatically, instead of actively searching for opportunities and taking actions, for instance, with regard to the transport system.

The inclination to spend public funds on projects that do not benefit the economy may respresent an obstacle to the economic and, thus, to supply chain development as well. The government should reconsider its investment priorities. The government should place more emphasis on investments that provide value to the economy. For instance, more funds should be spent on improving the rail transport system in Namibia.

6.3.3 South Africa

This section sheds light on the various statements that interviewees made with regard to weaknesses, areas and actions for improvements, obstacles as well as responsibilities of seaport, road transport networks, rail transport networks as well as manufacturing location performance in South Africa. Moreover, it presents and interprets the combined importance and performance values of each domain in South Africa.

6.3.3.1 Seaports

The statements on seaports are sorted according to the following sections, namely, port performance, port infrastructure and equipment, port operations, education and workforce, port charges, competition, port management and organisation as well as cross-cutting issues. The presentation of statements in categories is followed by the presentation and interpretation of combined importance and performance values of seaport attributes.

Port performance

This section presents the core statements on port performance.[179]

Compared to ports on the African continent, such as Luanda and Daressalam, ports in South Africa perform well and do not show any weaknesses. Compared to the global average port performance, ports in South Africa are on par. Compared to ports on the European continent, such as Bremerhaven or Amsterdam, ports in South Africa

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179   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-03-08	ZA-03-09	ZA-05-02	ZA-05-04	ZA-05-05	ZA-07-05
ZA-08-01	ZA-08-02	ZA-08-07	ZA-09-12	ZA-10-04	ZA-13-08
ZA-13-13	ZA-37-06	ZA-37-07	ZA-37-09	ZA-37-11	

can only keep pace. Compared to the best performing ports worldwide, ports in South Africa cannot keep up. In the recent past, ports in South Africa were falling behind.

Despite improvements in container terminal performance, the public port company does not provide the necessary performance.

Ports, such as the port of Durban, suffer from a lack of capacity. The port of Durban is the preferred port for many ocean carriers. The ports do not provide the necessary efficiency. Despite its high costs and low efficiency, the port of Durban serves as the gateway to the African continent.

The port of Walvis Bay provides a higher productivity than ports in South Africa, such as Durban. The capacity of the port of Walvis Bay has significantly been increased. Transit time from the port of Walvis Bay to hinterland countries, such as Zambia, is much shorter than from the port of Durban.

Because of higher reliability of ports and well-working cross-border transport corridors, companies often prefer South Africa as their gateway country. This is despite higher distances between ports in South Africa and destinations in countries further north.

During the last two years, the port business slowed down. However, the market demand strategy will gear the port business towards investment and development.

The performance of the ports will decide on future supply chain performance.

Port infrastructure and equipment

This section presents the core statements on port infrastructure and equipment.[180]

Crane performance in South Africa is far below crane performance in European ports.

Deficient handling equipment at a pier causes problems at the port of Durban.

Other interviewees state that the port infrastructure in South Africa is by far the best in the SADC.

To improve port performance in South Africa, new port equipment needs to be put in place.

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180   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-08-02	ZA-10-09	ZA-13-08	ZA-37-09		

Port productivity needs to be improved by means of digitisation of port operations. The country should look at and learn from countries, which already make use of it.

Capacity constraints are supposed to be eliminated by the new port development project in Durban.

Port operations

This section presents the core statements on port operations.[181]

It takes much more time to unload vessels in ports in South Africa than in some European countries.

Inefficiencies at ports arise on the seaside, i.e. before the vessel enters the port as well as the turnaround time within the port, and on the landside, i.e. the time before the lorry enters the port and the waiting time within the port.

Dwell time at the port of Durban is high. At the port of Durban, high dwell time results from congestion. At the port of Maputo, high dwell time results from availability and utilisation of high free storage time. At the port of Durban, the capacity is not sufficient. Other interviewees state that at the port of Durban, there is a lack of capacity. At the port of Maputo and at the port of Walvis Bay, supply and demand of capacity is in balance. In contrast to Durban, these ports are not congested. The lack of capacity at the port of Durban impedes transport and trade and, thus, supply chain performance in South Africa. Since the port of Durban is congested, companies make use of alternative ports, such as port of Maputo and Port Elizabeth.

The lack of capacity at the port of Durban leads to additional waiting time prior to unloading and loading.

Other interviewees state the port operations work well.

The low performance of ports in South Africa reduces the import process performance. Because of the high share of imports, high import time places a burden on manufacturing companies that are reliant on import goods from foreign suppliers.

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181   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-20-01	NA-23-07	NA-01-08	NA-01-09	ZA-03-07	ZA-03-10
ZA-03-11	ZA-04-01	ZA-04-02	ZA-07-05	ZA-09-14	ZA-10-04
ZA-10-05	ZA-10-08	ZA-10-09	ZA-13-05	ZA-37-09	ZA-37-11
ZA-40-14					

The exclusive public ownership and operation of ports in South Africa could be the reason for the shortfall in port productivity.

Actions to increase capacity of the port of Durban have been taken; there is, however, still a lack of capacity. Often, vessels have to wait a long time for berthing. This increases the costs of transhipment and transport. The port is in need of more piers to cope with the number of vessels and cargo volume.

The new port development project in Durban is expected to eliminate capacity constraints of the port of Durban.

Operations in some ports, such as Cape Town and Durban, are particularly weather-dependent, which either leads to waiting times or rerouting to other ports. In comparison, ports in Namibia are less affected by weather.

Because of the public ownership and management of the ports, the government is responsible for increasing productivity.

Education and workforce

This section presents the core statements on education and workforce.[182]

Labour strikes in ports, such as Durban, pose a serious risk to port operations in South Africa. To avoid delays during labour strikes, companies make use of ports in neighbouring countries, such as the port of Walvis Bay or Maputo.

The demand for preferential employment and scarcity of well-educated previously disadvantaged people creates incentives to change jobs frequently in order to raise salaries. This, in turn, leads to excessive labour cost increases and goes at the expense of companies and supply chain performance.

Because of the design of the affirmative action programme, people get into positions that exceed their qualifications. That impedes the performance of ports in South Africa.

Labour costs need to be reduced to improve port performance.

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182   Reference table to the appendix publication, as explained in footnote 83 on page 146.

NA-01-01	ZA-01-07	ZA-13-12	ZA-37-10	ZA-37-11	

Deficiencies in education and workforce do not only affect seaports, but the other supply chain domains as well. Thus, a comprehensive analysis of deficiencies in education and workforce follows in section 6.3.3.5 on the supply chain system of South Africa.

Port charges

This section presents the core statements on port charges.[183]

Productivity of ports in South Africa is significantly lower than in other geographic regions, such as Europe. At the same time, port charges are excessively high. The port of Durban is one of the least efficient and one of the most expensive ports worldwide.

Port charges in Maputo are lower.

Port charges and their annual increases are high at an international comparison. High port charges have a similar effect to an import tax – high port charges impede international trade. The exclusive public ownership and lack of competition creates a monopoly situation.

The shortfall in productivity may be traced back to the exclusive operation and ownership of seaports by the public sector.

Because of its geographical location, ports in South Africa serve as a transhipment hub. However, because of high port charges shipping lines moved to less cost-intensive transhipment hubs and ports in South Africa lost business volume.

Because price is a major determinant in transport in southern Africa, it is not only the availability of capacity that matters, the level of port charges plays a major role as well.

Despite insufficient efficiency and high costs, the port of Durban still serves as the gateway to southern Africa.

The productivity needs to be improved in order to justify the high port charges.

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183   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-05	ZA-01-06	ZA-05-04	ZA-07-05	ZA-13-07	ZA-13-14
ZA-13-15	ZA-37-06	ZA-37-09	ZA-37-10		

The efficiency and port charges will decide on port performance and supply chain performance in South Africa in the future.

The time it takes to unload vessels and tranship cargo to road and rail transport needs to be reduced. The labour costs need to be reduced. However, labour costs are not going to change.

Improvements in port performance should start with increases in productivity and reductions in port charges in order to increase port calls.

Competition

This section presents the core statements on competition.[184]

There is not enough competition in the port industry in South Africa.

There is a lack of competition among terminal operators in South Africa. In contrast, ports in Europe compete against each other. Similarly, other interviewees state that there is no considerable port competition in southern Africa; only the port of Walvis Bay and the port of Maputo represent alternatives. However, other interviewees state that the competitive position of Port Elizabeth deteriorated because of a limited water depth and alternative ports in South Africa.

If the port of Walvis Bay responds adequately to the market demand, the port of Cape Town may be faced with competition. However, because business volume is increasing in the SADC, even if the port of Walvis Bay gains in volume, its market share will not increase to the same extent.

Port management and organisation

This section presents the core statements on port management and organisation.[185]

The exclusive public ownership and operation of ports in South Africa stands in contrast to port management models in other southern African countries. In Angola and

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184   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| ZA-13-07 | ZA-13-11 | ZA-13-15 | ZA-37-07 | | |

185   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-10	ZA-01-11	ZA-01-12	ZA-01-13	ZA-01-15	ZA-02-06
ZA-05-05	ZA-08-06	ZA-13-12	ZA-13-16	ZA-13-17	ZA-13-18
ZA-13-19	ZA-38-06				

Mozambique, the private sector participates in port ownership and management. The exclusive operation and ownership could explain the shortfall in port productivity.

A participation of the private sector could increase productivity. Private sector participation should entail the right of co-determination at the management level. There is a need for private sector participation in ports, for instance in terminal operations.

Ports should be run as a public-private partnership with a major international terminal operator. Ports should be owned and managed under public-private partnership in order to gear the port business towards market demand and competition.

However, the government of South Africa does not desire private sector participation in ports. This attitude could stem from a fear of loss of public revenues.

The government of South Africa is, however, a difficult business partner. The willingness of private companies to engage in a partnership with the government is questionable.

The port act requires that there is private participation in new port projects. There is, however, a risk that private companies siphon off profits without reinvesting.

In contrast to rail freight, a privatisation of ports would pose a challenge.

The Department of Trade and Industry with its state-owned enterprises is responsible for improving port performance. The willingness of the government to maintain complete control over ports and the unwillingness to accept external influence represents an obstacle.

Good examples for public-private partnerships in ports can be found in Mombasa and Maputo. There are ports in western Africa, such as the port of Abidjan in the Ivory Coast, which are run successfully by public-private partnerships. The port of Abidjan is not only a good example of a good port, but also of a well-functioning railway to its hinterland and landlocked countries.

Cross-cutting issues

This section presents the core statements on cross-cutting issues.[186]

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186   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| ZA-01-14 | ZA-03-11 | ZA-03-12 | ZA-03-21 | ZA-08-05 | ZA-08-08 |
| ZA-10-06 | ZA-10-07 | ZA-13-17 | ZA-37-05 | ZA-37-07 | ZA-37-12 |

Because of public ownership and operation of ports in South Africa, the responsibility to improve port performance lies with the government.

The satisfaction with the current level of performance, the unwillingness to take actions for further improvements as well as the ignorance of port competition in southern Africa represent obstacles to further improvement of the port of Durban.

The government is aware of the deficiencies in ports and is keen to improve port performance. The speed of action for improvements is insufficient. However, this issue is even more pronounced in the rail transport system.

The government invests in seaports. However, the amount of investment is not sufficient. The scarcity of funds constrains higher investments.

The only worrying factor in port performance is the ability to raise funds. This affects how ports are developed in the future.

There is a risk that the looming downgrading of the credit rating of South Africa as well as political interference and bureaucracy will negatively affect port performance. Due to the low credit rating of public enterprises and the state, funding of new investments will become more difficult.

The government has the right vision for the port development in South Africa. However, unless there is private participation and investment, the port development completely relies on public funding.

The fear that new emerging ports in southern Africa will reduce port handling volume in South Africa will not become a reality. Because the market for port services is growing in southern Africa, perceivable gains in port volume in Walvis Bay will be higher than losses in South Africa.

It is difficult to find good examples in the supply chain sector on the African continent that South Africa could look at and learn from. Good examples can rather be found in Europe. Ports work well in Germany – that is a good example for South Africa to look at.

Importance and performance of seaport attributes

Figure 6-12 illustrates the average relative importance values[187] of seaport attributes across countries as well as the average performance values[188] of these attributes in South Africa. To recap, 18 respondents evaluated the importance of seaport attributes. Eight respondents rated the performance of seaport attributes in South Africa. Due to the low number of respondents, the questionnaire and the personal interview results should be analysed coherently in order to provide a meaningful picture.

To give an overview, respondents assigned a good to fair rating to port performance in South Africa.[189] Whilst respondents assigned a good to fair performance rating to public policies and services, operations as well as landward accessibility, respondents assigned a good performance rating to infrastructure and seaward accessibility – in ascending order. With this overview in mind, this section now presents the details by attribute.

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187   For ease of interpretation and analysis, the average relative importance values have been translated into verbal expressions, by means of the following scheme: standard deviation (σ) = 9.1 %; mean (μ) = 20 %; μ - 1σ = 10.9 %; μ + 1σ = 29.1 %

$\mu + 1\sigma$	<	x	≤	100 %	High
μ	<	x	≤	$\mu + 1\sigma$	Medium to high
$\mu - 1\sigma$	≤	x	<	μ	Medium to low
0 %	≤	x	<	$\mu - 1\sigma$	Low

188   For ease of interpretation and analysis, the average degree of agreement values have been translated into verbal expressions, by means of the following scheme:
1.0 – 2.4   Strong agreement   Good
2.5 – 3.4   Slight agreement   Good to fair
3.5 – 4.4   Slight disagreement   Fair to poor
4.5 – 6.0   Strong disagreement Poor

189   The mean value and standard deviation across all five attributes of port performance in South Africa is 2.6 and 0.4, respectively.

Figure 6-12: Importance and Performance – Seaports South Africa
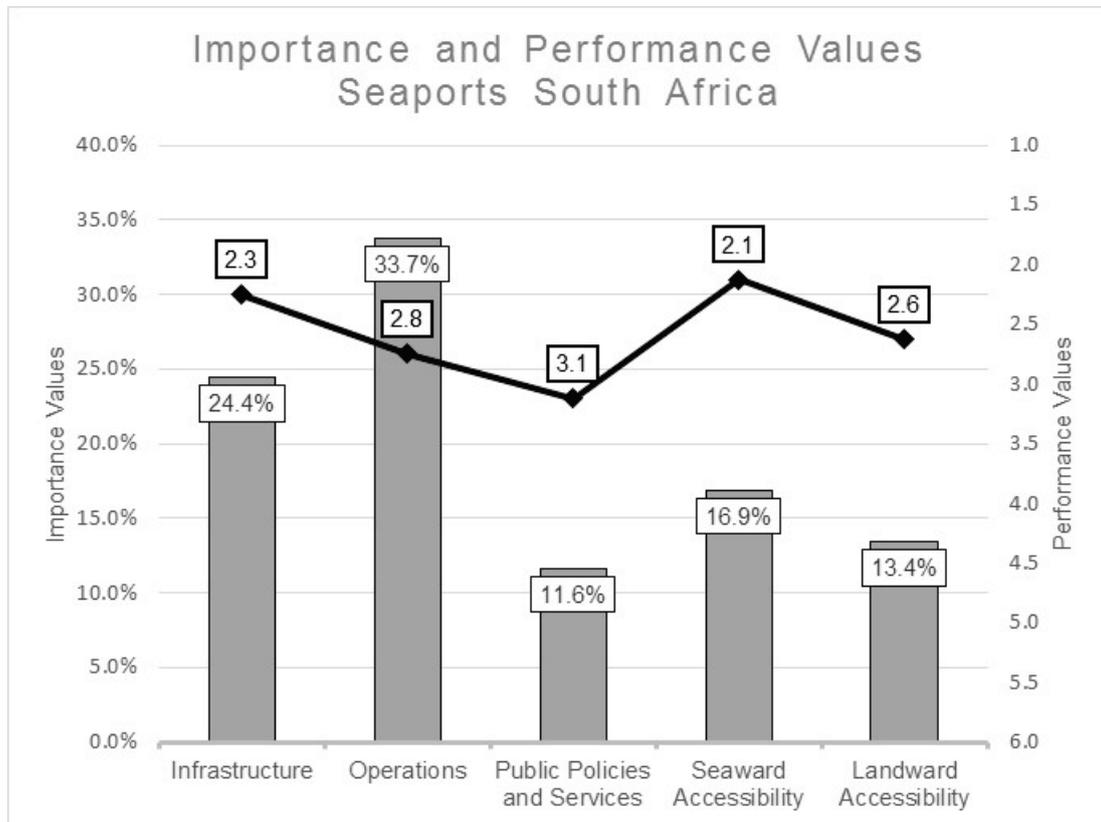
First, the "equal weight" procedure is applied.[190] This procedure yields the following picture and leads to the following conclusions.

Respondents assigned a medium to high importance (24.4 %) as well as a good performance (2.3) to infrastructure. The medium to high importance would even justify a slightly lower performance. Thus, the infrastructure does not seem to represent a constraint to seaport performance in South Africa.

Respondents assigned a high importance (33.7 %) as well as a good to fair performance (2.8) to operations. The high importance argues for a higher than good to fair performance. Thus, the operations seem to represent a constraint to seaport performance in South Africa.

Respondents assigned a medium to low importance (11.6 %) as well as a good to fair performance (3.1) to public policies and services. The medium to low importance

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190   The "equal weight" procedure gives an equal weight to the importance and performance component, as described in section 6.3.1.1 on page 158.

would even justify a lower performance. Thus, public policies and services do not seem to represent a constraint to seaport performance in South Africa.

Respondents assigned a medium to low importance (16.9 %) as well as a good performance (2.1) to seaward accessibility. The medium to low importance would even justify a lower performance. Thus, the seaward accessibility does not seem to represent a constraint to seaport performance in South Africa.

Respondents assigned a medium to low importance (13.4 %) as well as a good to fair performance (2.6) to landward accessibility. The medium to low importance would even justify a lower performance. Thus, the landward accessibility does not seem to represent a constraint to seaport performance in South Africa.

Second, the "higher weight towards performance" procedure is applied.[191] This procedure yields the following picture and leads to the following conclusions: Public policies and services received the lowest performance value. Thus, public policies and services seem to represent a constraint to seaport performance in South Africa.

Consequently, all in all, operations as well as public policies and services seem to represent constraints to seaport performance in South Africa.

6.3.3.2 Road Transport

The statements on road transport networks are sorted according to the following sections, namely, road transport performance, road infrastructure, rolling stock, transport operations, cross-border transport, public regulation, security as well as cross-cutting issues. The presentation of statements in categories is followed by the presentation and interpretation of combined importance and performance values of road transport network attributes.

Road transport performance

This section presents the core statements on road transport performance.[192]

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191   Provided that an attribute is important, irrespective of the actual level of importance, the "higher weight towards performance" procedure gives a higher weight to the performance component, as described in section 6.3.1.1 on page 159.

192   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-09-15	ZA-10-10	ZA-10-14	ZA-31-06	ZA-31-07	ZA-37-13
ZA-37-14					

The distribution of finished vehicles generally works. There are, however, some weaknesses. Other interviewees state that the road transport system is able to meet any requirements. The high performance of the road transport industry keeps the economy competitive in cross-border transport.

The road transport performance is highest in South Africa among southern African countries. Road transport performance is much higher in South Africa than in other southern African countries. Nonetheless, weaknesses and challenges exist.

Road infrastructure

This section presents the core statements on road infrastructure.[193]

The road infrastructure is deteriorating. The infrastructure of secondary roads is deteriorating. Road infrastructure of secondary roads is below national road infrastructure. The infrastructure of primary roads is good. Other interviewees state that the road infrastructure is good or very good.

In the past decade, secondary roads were not maintained adequately. Secondary road infrastructure is in need of maintenance. The existing road infrastructure is not maintained sufficiently. In comparison, the road infrastructure of the Trans-Kalahari Corridor in Namibia is well maintained.

The country has a large road network. However, the geographical size of the country represents a challenge to the adequate maintenance of secondary and tertiary road infrastructure.

Municipalities do not have the necessary staff capacity to invest in new and maintain the existing infrastructure as well as to enforce the law.

The usage-based payment system on main roads allows keeping the main road infrastructure well maintained. However, the electronic toll system is not able to ensure usage-dependent financing in the Gauteng Province. The costs of road upgrades are much higher than the revenues from road usage charges. There is a lack of control of payments. Because users are reluctant to pay for road toll and fuel levy, only 20 per

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193   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-17	ZA-02-08	ZA-02-10	ZA-02-11	ZA-03-15	ZA-03-16
ZA-05-06	ZA-05-14	ZA-10-10	ZA-10-11	ZA-10-12	ZA-10-13
ZA-10-15	ZA-11-04	ZA-31-11	ZA-31-15		

cent of road users pay road usage charges. In addition, revenues from fuel levies are not earmarked for the road sector.

The total freight volume in South Africa is increasing. Whilst the volume on railways remains stable, the volume on roads increases. Too much rail-friendly freight is carried on roads. Because requirements to transport are increasing and road transport is able to meet these requirements, the additional freight volume is absorbed by road transport.

There is a need for improvement in road infrastructure. Investments in road infrastructure should be accompanied by improvements in law enforcement with regard to vehicle condition, overloading as well as driver behaviour and licences.

The government invests in road infrastructure. However, a lack of funds hinders higher amounts of investment.

The scarcity of funds impedes new investment and adequate maintenance of road infrastructure. In addition, corruption and inoperability lead to inappropriate contracting.

The scarcity of public funds represents an obstacle to improvements in road transport. In order to provide the necessary funds, there is a need for higher economic growth as well as fiscal prudence.

The road infrastructure in Tanzania is not as good as in South Africa, but it is being well developed. The country is investing a lot in road infrastructure. The gravel roads are being well maintained in Namibia. These are good examples South Africa should look at and learn from.

Rolling stock

This section presents the core statements on rolling stock.[194]

There is an oversupply of vehicles in the road transport industry in South Africa.

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194   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-03-13	ZA-12-09					

Due to the sustained weakness of the local currency and high transport distances, higher costs of fuel imports for road transport significantly increase the costs to companies.

Transport operations

This section presents the core statements on transport operations.[195]

There are imbalances between import and export volumes and, thus, imbalances between inbound and outbound road freight. A large share of lorries return empty to South Africa.

Cross-border transport

This section presents the core statements on cross-border transport.[196]

There are frequent delays at border crossings between South Africa and Mozambique. Border processes take too much time and cause delays.

Efficiency of border processes needs to increase.

Corruption at border crossings needs to reduce.

There are plans to set up one-stop border posts at South African borders, for instance at the Komatipoort-Ressano Garcia border post to Mozambique and at Beitbridge to Zimbabwe. The governments have already agreed to set up one-stop border posts. The one-stop border post at Chirundu between Zambia and Zimbabwe shows that one-stop border posts can work in southern Africa. However, plans to set up one-stop border posts have existed for 20 years; it is only now that governments are taking actions. Governments and public authorities are responsible for setting up one-stop border posts.

There are two major obstacles to the implementation of one-stop border posts. First, traditional border posts provide opportunities for corruption and one-stop border posts

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195   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-05-07					

196   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-16	ZA-02-09	ZA-04-04	ZA-05-12	ZA-09-03	ZA-10-14
ZA-31-16	ZA-37-05	ZA-37-08	ZA-37-15	ZA-37-16	ZA-37-17
ZA-37-18	ZA-37-19	ZA-37-20			

would reduce or eliminate these opportunities. This causes resistance. Second, the lack of funding and willingness impedes their set up and implementation. Because neighbouring countries, such as Mozambique, are reliant on income from trade, border controls are necessary.

Nonetheless, there have been significant improvements at border crossings during the last five years, such as electronic submission of customs documents. There are, however, still significant constraints at border crossings, such as the necessity to pass through border posts and inspections on both sides of the border. This causes additional border crossing time of several days and leads to significant transport delays, for instance at the Kasane border crossing between Namibia and Botswana. This increases the import costs and costs of goods in landlocked countries by 25 per cent.

At the Kasane border between Namibia and Botswana, a new bridge is being built. This bridge is expected to reduce congestion and, thus, the costs of crossing borders. In other regions, like Europe, such a bridge would have been built many years ago. It took too much time to decide on the construction of that bridge.

There is incomplete visibility in cross-border transport. Cross-border transport processes bring together and rely on people from different cultures, people with different educational backgrounds and companies make use of third parties. Too many factors outside the companies' control affect cross-border transport performance.

During the last ten years, whilst the costs of road transport have gone up, the cross-border transport rates went down. Whilst large transport companies are able to compensate cost increases by means of economies of scales, smaller transport companies have to accept reductions of margins. Larger transport companies tend to extend their fleets in order to increase economies of scale; smaller transport companies have no choice but to accept shrinking margins and, eventually, exit the transport market.

For about two years, the government allows registered non-South African road transport companies to carry bonded cargo from South Africa to hinterland countries. This regulatory change laid the foundation for equal market access for South African and foreign transport companies and brought about competition into the South African cross-border transport market.

Instead of putting rail-friendly freight on roads, cross-border rail transport performance should be increased.

It is difficult to find good examples in the supply chain sector on the African continent that South Africa could look at and learn from. Good examples can rather be found in Europe. In Europe, road transport does not have to stop at borders; that is different in southern Africa. However, because countries in the SADC necessitate income from cross-border trade, border posts cannot be abolished like in Europe.

Public regulation

This section presents the core statements on public regulation.[197]

There are weaknesses in public regulation. Law enforcement does not work well. Law enforcement is not as good as it is supposed to be and it is getting worse. It is not the lack of legislation, but rather the insufficient degree of law enforcement.

There are deficiencies in enforcement of regulation on vehicle condition, load limitations as well as driver behaviour and licences.

Enforcement of load regulation does not work well.

Solutions to eliminate deficiencies in transport regulation, such as load accreditation programmes, exist.

The government considers the costs of law enforcement to be higher than the benefits.

High competition in the road transport industry negatively affects margins and business practices. Some transport companies take unfair measures to gain a competitive advantage. Industry organisations should have the right to penalise unsustainable business practices. The ease of setting up a new company fosters non-compliant behaviour.

The situation that transport companies try to circumvent regulatory requirements does not only exist in South Africa, but is an issue in many countries on the African continent.

There is a need for more intensive law enforcement.

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197   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-18	ZA-05-06	ZA-05-12	ZA-09-16	ZA-09-17	ZA-10-15
ZA-31-07	ZA-31-08	ZA-31-09	ZA-31-10	ZA-37-14	ZA-37-15

Continuous operations at weighbridges at any time as well as prevention of bribery are necessary. Education and training of traffic inspectors needs to be improved – this is the most difficult issue to address. The lawful behaviour of traffic inspectors needs to increase.

The road freight industry and the government of Australia have successfully implemented self-regulatory measures. That is a good example to look at and South Africa is doing so.

The third country rule along with the geographic location puts road transport companies in South Africa at a disadvantage. Foreign road transport companies are allowed to make use of a larger transport market and increase their business volume.

Whilst foreign road transport companies are allowed to buy second-hand vehicles, for instance lorries that have been run by owner-drivers on perfect roads in the USA or Europe, South African road transport companies are not allowed to do so. Thus, although South African vehicles are in a better condition, their costs are much higher.

Security

This section presents the core statements on security.[198]

Theft and hijacking are weaknesses in road transport.

Cross-cutting issues

This section presents the core statements on cross-cutting issues.[199]

Freight needs to be shifted from road to rail; at the same time, road transport needs to be made more efficient.

The realisation of large capital funding projects needs to improve.

The government is responsible for improving the public part of the road transport system. The Department of Transport is responsible for taking action for improvement.

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198   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-10-10					

199   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-14	ZA-02-13	ZA-05-13	ZA-37-05		

It is difficult to find good examples in the supply chain sector on the African continent that South Africa could look at and learn from. Good examples can rather be found in Europe. Road transport works well in Germany – that is a good example for South Africa to look at.

Importance and performance of road transport network attributes

Figure 6-13 illustrates the average relative importance values[200] of road transport network attributes across countries as well as the average performance values[201] of these attributes in South Africa. To recap, 16 respondents evaluated the importance of road transport network attributes. Seven respondents rated the performance of road transport network attributes in South Africa. Due to the low number of respondents, the questionnaire and the personal interview results should be analysed coherently in order to provide a meaningful picture.

To give an overview, respondents assigned a good to fair rating to road transport performance in South Africa.[202] Whilst respondents assigned a fair to poor rating to public policies and services, a good to fair rating to transhipment centres as well as transport operations, respondents assigned a good rating to equipment and facilities and infrastructure – in ascending order. With this overview in mind, this section now presents the details by attribute.

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200   For ease of interpretation and analysis, the average relative importance values have been translated into verbal expressions, by means of the following scheme: standard deviation (σ) = 11.8 %; mean (μ) = 20 %; μ - 1σ = 8.2 %; μ + 1σ = 31.8 %
μ + 1σ < x ≤ 100 %   High
μ < x ≤ μ + 1σ Medium to high
μ - 1σ ≤ x < μ Medium to low
0 %   ≤ x < μ - 1σ Low

201   For ease of interpretation and analysis, the average degree of agreement values have been translated into verbal expressions, by means of the following scheme:
1.0 – 2.4   Strong agreement   Good
2.5 – 3.4   Slight agreement   Good to fair
3.5 – 4.4   Slight disagreement   Fair to poor
4.5 – 6.0   Strong disagreement Poor

202   The mean value and standard deviation across all five attributes of road transport network performance in South Africa is 2.8 and and 0.5, respectively.

Figure 6-13: Importance and Performance – Road Transport South Africa
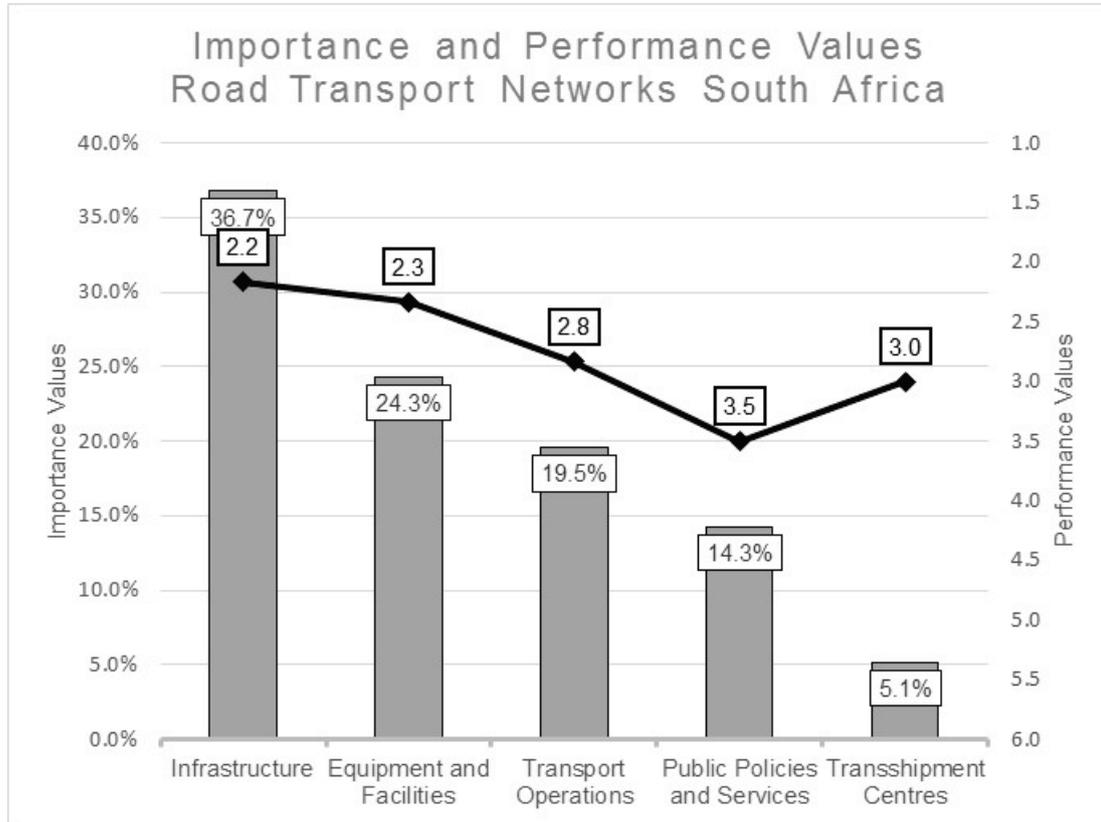
First, the "equal weight" procedure is applied.[203] This procedure yields the following picture and leads to the following conclusions.

Respondents assigned a high importance (36.7 %) as well as a good performance (2.2) to infrastructure. The high importance is in line with the good performance. Thus, the infrastructure does not seem to represent a constraint to road transport performance in South Africa.

Respondents assigned a medium to high importance (24.3 %) as well as a good performance (2.3) to equipment and facilities. The medium to high importance would even justify a slightly lower performance. Thus, the equipment and facilities do not seem to represent a constraint to road transport performance in South Africa.

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203   The "equal weight" procedure gives an equal weight to the importance and performance component, as described in section 6.3.1.1 on page 158.

Respondents assigned a medium to low importance (19.5 %) as well as a good to fair performance (2.8) to transport operations. The medium to high importance would justify a slightly lower performance. Thus, the transport operations do not seem to represent a constraint to road transport performance in South Africa.

Respondents assigned a medium to low importance (14.3 %) as well as a fair to poor performance (3.5) to public policies and services. The medium to low importance is in line with the fair to poor performance. Thus, the public policies and services do not seem to represent a constraint to road transport performance in South Africa.

Respondents assigned a low importance (5.1 %) as well as a good to fair performance (3.0) to transhipment centres. The low importance would even justify a lower performance. Thus, the transhipment centres do not seem to represent a constraint to road transport performance in South Africa.

Second, the "higher weight towards performance" procedure is applied.[204] This procedure yields the following picture and leads to the following conclusions: Public policies and services received the lowest performance value. Thus, public policies and services seem to represent a constraint to road transport performance in South Africa.

Consequently, all in all, the public policies and services seem to represent a constraint to road transport performance in South Africa. The limited database does not allow for further differentiation. Additional sources of information will allow for a further differentiation at a later stage.

6.3.3.3   Rail Transport

The statements on rail transport networks are sorted according to the following sections, namely, rail transport performance, rail infrastructure, equipment, transport operations, education and workforce, competition, management and organisation, ownership and operating structure as well as cross-cutting issues. The presentation of statements in categories is followed by the presentation and interpretation of combined importance and performance values of rail transport network attributes.

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204   Provided that an attribute is important, irrespective of the actual level of importance, the "higher weight towards performance" procedure gives a higher weight to the performance component, as described in section 6.3.1.1 on page 159.

Rail transport performance

This section presents the core statements on rail transport performance.[205]

During the 1980s, rail transport was the primary mode of transport in South Africa. At that time, rail transport performance was good and the costs of rail transport were significantly lower than the costs of road transport.

Some interviewees state that in 1985, because of adequate rail transport capacity, the government decided to omit investments in rail transport infrastructure. Other interviewees state that in the 1990s, the rail company realised that there is too much freight on railways and the existing rail transport system could not cope with it anymore. Then, the rail transport company decided to shift freight from rail to road. By doing so, the rail transport company laid the foundation for today's low rail transport performance.

Since then, the rail transport system has been neglected. Between 1985 and 2005, rail transport performance deteriorated. Since the deregulation of the road transport sector, rail transport performance deteriorated. The deterioration of rail transport performance contributed to its own redundancy. Freight volume moved from rail to road. Low rail transport performance could be compensated by high road transport performance. Road transport became the primary mode of transport in South Africa. Road transport saved the economy from constraints in freight transport and, thus, the economy from a decline.

Nonetheless, because of the high transport distances, rail transport is a reasonable mode of transport in South Africa.

20 years ago, the freight volume was much lower than it is today. Instead of rail transport, road transport almost exclusively absorbed the increase in volume.

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205   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-19	ZA-02-14	ZA-02-15	ZA-02-16	ZA-02-17	ZA-02-19
ZA-03-17	ZA-03-20	ZA-05-15	ZA-05-16	ZA-05-17	ZA-06-01
ZA-07-06	ZA-07-07	ZA-07-08	ZA-09-05	ZA-09-18	ZA-09-19
ZA-09-21	ZA-10-14	ZA-10-16	ZA-10-17	ZA-14-08	ZA-31-01
ZA-31-12	ZA-31-14	ZA-31-15	ZA-31-18	ZA-37-21	ZA-37-28
ZA-38-10	ZA-40-16	ZA-41-01	ZA-41-03	ZA-41-08	ZA-41-10
ZA-41-25					

Today, because of the higher requirements to transport, the shift of freight volume from rail to road transport cannot be reversed.

Rail transport performance in South Africa is poor. Rail transport performance is insufficient. Today, rail transport is not reliable and time-efficient anymore. The speed of transport is low in South Africa. Rail transport performance does not meet the market requirements anymore. Because of insufficient rail transport performance, companies do not make use of rail transport. The automobile industry is struggling with the existing rail transport performance. Even rail-friendly freight is transported on roads. The low rail transport performance keeps potential customers from making use of it.

Rail transport performance between the port of Durban and the Gauteng province is insufficient. Other interviewees state that between the port of Durban and the Gauteng province, rail transport performance is good.

Cross-border rail transport performance is insufficient.

During the last ten years, rail freight stagnated in South Africa. Since 2012, rail transport volumes – apart from the year 2015 – increased. Still today, by far too little freight volume is carried by rail transport and there is a potential for more rail freight. Many types of freight, such as bulk and containerised freight, lend themselves to rail transport. Rail could become much more important in the transport of containerised freight.

Other interviewees plead, however, that the rail transport system is good in South Africa. The rail transport performance from the port of Durban to the Gauteng province as well as from Port Elizabeth to the Gauteng province is good. Yet other interviewees state that rail transport performance is generally fair. There are some weaknesses.

In the past, the rail transport system deteriorated, but ongoing investments have already led to improvements. The rail transport performance has improved, albeit not as much as the rail transport company expected. The rail transport system is improving. The rail transport company is aware of the weaknesses and is busy implementing measures for improvement. Other interviewees oppose that improvements are not apparent.

Between different types of goods, rail transport performance varies significantly. Rail transport performance of general freight, such as containers or finished vehicles, is insufficient and in need of improvement. The performance of rail transport cannot

keep up with road transport performance. Rail transport performance of heavy bulk freight is good. On long-distances, bulk rail freight transport performance is high or even very high and able to keep up with other modes, such as road transport. Rail transport can only show its strength in case of high transport volumes and long distances. Other interviewees add that bulk rail transport performance has improved. Rail transport performance of bulk goods is a strength of the rail transport system.

Because of a lack of transport capacity, the railway line from the Mpumalanga province to the port of Richards Bay lost freight for almost a decade.

There is a need for improvement in rail transport performance, especially for containers and finished vehicles as well as other rail-friendly freight.

Not just in South Africa, but in many countries on the African continent rail transport systems are struggling to meet the market requirements. Despite deficiencies in rail transport performance, the rail transport system in South Africa seems to be the best rail transport system on the African continent.

Rail infrastructure

This section presents the core statements on rail infrastructure.[206]

During the 1990s, maintenance and development of the rail infrastructure was neglected. Until 2004, the state of rail infrastructure was good. Since then, rail transport infrastructure has been deteriorating. Deficiencies in infrastructure cause derailments and make speed limits necessary. The harsh environment in certain regions keeps infrastructure from functioning well. The resulting breakdowns and stoppages lead to damages and theft. Deficiencies in infrastructure lead to deficiencies in transport reliability. Interviewees remark that it is not only rail transport that is subject to theft, road transport suffers from theft as well.

In the past, the investment in rail infrastructure was below the necessary investment. The state of the infrastructure is not sufficient and the costs are high. The state of the

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206   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-19	ZA-02-18	ZA-03-18	ZA-03-19	ZA-07-06	ZA-07-08
ZA-07-10	ZA-07-12	ZA-09-20	ZA-10-17	ZA-10-18	ZA-10-20
ZA-13-04	ZA-14-08	ZA-31-16	ZA-31-18	ZA-37-29	ZA-41-12
ZA-41-19	ZA-41-20	ZA-41-21			

rail transport infrastructure is similar throughout South Africa. The insufficient investment led to the deterioration of the rail transport performance.

Apart from the bulk railway lines, the railway system is not equipped with the necessary infrastructure to run very long trains. On bulk lines, the high freight volume justifies high investments in infrastructure and contributes to high rail transport performance.

There is a lack of rail infrastructure. Whilst capacity supply for pre-carriage to ports is sufficient, there is a lack of capacity for on-carriage from ports to the hinterland. Interviewees state that this view stands, however, in contrast to the view of the rail transport company.

There are not enough interfaces and transhipment centres for intermodal transport. There is a lack of capacity at rail terminals. The rail transport infrastructure is not geared towards the needs of the market.

It is currently being analysed whether a shift from narrow gauge to standard gauge size is reasonable. There is a serious plan to absorb the expected increase in freight volume not only by road transport but also by rail transport.

Gauge sizes vary between countries in southern Africa. On cross-border transport, traction units need to be changed in order to allow for cross-border rail transport. Differences in rail infrastructure among countries impede cross-border rail transport in southern Africa.

The extent of the rail network is small. The rail network coverage needs to be increased.

There is a need for continued and additional investments in infrastructure in order to increase rail transport performance.

There are plans to improve the rail infrastructure, but they lack implementation. Contracts for infrastructure measures are awarded to companies, which do not have the necessary qualification to fulfil the orders.

Because rail infrastructure is publicly owned, the public sector is responsible for improvements.

Equipment

This section presents the core statements on equipment.[207]

Deficiencies in rolling stock allocation contribute to low rail transport performance.

In the past, the investment in rolling stock was below the necessary investment. The insufficient investment led to the deterioration of rail transport performance. Before the year 2012, the rail transport company invested little it its locomotive fleet. The locomotive fleet is very old. In 2012, an investment programme was set up to replace the old fleet. In 2015, the rail transport company received the first new locomotives and within the coming years, many more new locomotives are still to come.

There are a number of technical and organisational challenges in rail transport. On long distances, different traction modes require changes of locomotives. Changes of locomotives, in turn, require crew changes. Moreover, limited allowable working hours make crew changes necessary as well. These issues lead to transport interruptions.

The traction varies between different rail transport systems in southern Africa and makes it necessary to change locomotives. Because there is a high potential for cross-border rail transport, this incompatibility should be sorted out with priority.

There is a need for continued and additional investments in rolling stock in order to improve rail transport performance. The locomotives need to improve.

Transport operations

This section presents the core statements on transport operations.[208]

Although road and rail distances on the Durban-Gauteng Corridor are more or less the same, the rail transport time is much higher than the road transport time. Some

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207   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-07-10	ZA-14-09	ZA-31-16	ZA-31-18	ZA-41-11	ZA-41-12
ZA-41-18	ZA-41-21				

208   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-21	ZA-02-22	ZA-06-02	ZA-07-06	ZA-07-10	ZA-09-23
ZA-10-16	ZA-10-17	ZA-10-20	ZA-14-06	ZA-14-08	ZA-14-09
ZA-31-13	ZA-37-28	ZA-40-15	ZA-40-17	ZA-41-01	ZA-41-02
ZA-41-03	ZA-41-04	ZA-41-05	ZA-41-06	ZA-41-07	ZA-41-09
ZA-41-19	ZA-41-21				

interviewees state that because rail transport requires pre- and on-carriage, the rail transport time is higher than the road transport time. Other interviewees object that this argument does not hold true, because on long distances road transport makes use of transhipment as well.

Other interviewees state that although distances on the Durban-Gauteng Corridor are sufficient for rail transport to successfully compete with road transport, rail transport time is much higher than road transport time. The necessary transhipment of rail transport as well as additional pre- and on-carriage cause some days of additional transport time.

Because of deficiencies in rail transport performance, companies do not make use of rail transport. Because of deficiencies in rail transport performance, companies do not make use of intermodal transport. Interviewees state that piggyback rail transport service does not exist in South Africa.

Visibility during transport is much lower in the case of rail transport compared to road transport. The rail transport company often does not have any information on the current location of trains and freight. Shippers and cargo owners, however, expect to know where their freight is. The lack of visibility during transport can be traced back to a number of reasons, such as lack of control and lack of care in transport operations.

It lacks frequent and consistent services. The rail transport services need to be more consistent. The rail transport time varies significantly. Delays are the main weakness of rail transport performance in South Africa. Delays need to be sorted out in order to meet customer requirements. Reductions in delays would lead to significant improvements in rail transport performance.

Interviewees state that the issue is not so much deficiencies in services, but rather deficiencies in the tariff structure. There is a need for a reduction in tariffs. Other interviewees state that the costs of rail transport need to improve. Other interviewees plead that rail freight rates are not a weakness, but become a weakness if the service does not meet the customer expectations. Despite lower direct costs of rail transport, lower reliability and efficiency of rail transport compared to road transport often make road transport the preferred mode.

Rail transport operations are inefficient. However, the low performance of the rail transport system is not only a result of the low efficiency of transport operations, but also results from the congestion at the port of Durban.

Rail transport is susceptible to weather conditions.

The rail transport operations and services need to improve. There is a need of more reliable transport services. There is a need of more frequent rail transport services. There is a need of a railway along the coast from South Africa to Mozambique.

To run railway lines at a high performance level, sound planning is necessary. In bulk goods, the high predictability and high volumes as well as low number of shippers facilitate sound planning of rail transport. In the case of general freight, the low volumes and high number of shippers as well as the resulting need for transhipment and consolidation impede sound planning. In addition, the reliability of cargo owners in providing cargo for consolidation on time affects rail transport performance as well.

In contrast to other countries, there is a high degree of unpredictability in rail transport in South Africa. First, the rail transport company provides its customers with a high degree of flexibility. The allowance of flexibility, however, undermines the ability to plan transport operations adequately. Second, rail transport operations suffer from a lack of compliance with the rail company's own schedules. There are delays in the provision of equipment. In the future, the rail transport company needs to ensure that both customers as well as the company itself complies with schedules in order to increase rail transport performance. Third, there is not enough coordination among relevant stakeholders, such as shippers, ports and the rail transport company, and each stakeholder makes up their own planning. The rail transport company is currently establishing centres that will coordinate planning and execution of rail transport operations among various stakeholders. The implementation is still at an early stage and customers are not involved yet.

There is a need for improved planning procedures. Planning procedures need to be able to quickly restore scheduling and routing in case of unexpected events.

The transport services and freight forwarding services should be separated. The transport company should focus on transport operations, the government should become a freight forwarder with an integration of a broad range of transport services.

The public rail transport company limits capacity on the line from South Africa to the port of Maputo in order to direct freight through its own seaports.

Education and workforce

This section presents the core statements on education and workforce.[209]

During the 1990s, many skilled people left the rail transport industry. As part of the political and economic transition, many skilled people were replaced. This led to negligence of maintenance and development of the rail transport system.

Deficiencies in education and workforce do not only affect rail transport, but the other supply chain domains as well. Thus, a comprehensive analysis of deficiencies in education and workforce follows in section 6.3.3.5 on the supply chain system of South Africa.

Competition

This section presents the core statements on competition.[210]

Instead of putting rail-friendly freight on roads, cross-border rail transport performance should be improved. Improvements in cross-border rail transport performance would significantly increase South Africa's cross-border transport corridor performance. Improvements in cross-border transport corridor performance should be prioritised.

On distances up to 600 kilometres, rail transport faces fierce competition with road transport. On that distance, rail and road transport costs are similar. However, much higher road transport performance, even on that distance, makes road transport the preferred mode of transport.

Road and rail transport should not be regarded as competing modes of transport, but rather as complementary along inter- and multimodal supply chains. Whilst the strength of rail transport lies in heavy freight on long distances, the strength of road lies in its flexibility. There is a need of intermodal transport. A multimodal approach with rail transport between ports and freight stations is an option.

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209   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-10-18					

210   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-31-15	ZA-31-16	ZA-31-17	ZA-37-23		

Because of lower costs compared to road transport, the ability to transport large freight volumes and the possibility to tightly control transport on rails, many governments in southern Africa are keen on improving rail transport performance.

Management and organisation

This section presents the core statements on management and organisation.[211]

Up to the 1980s, shippers did not have any modal choice for heavy freight transport. Rail transport was the only option for heavy freight. There is no competiton in rail transport. Thus, the rail transport company did not see any need to gear its business towards the needs of customers. In the past, the rail tansport company did not place enough value on the needs of customers.

In the 1980s, the legislator increased the load limitation of lorries and this created some competition among road and rail transport. Since then, rail transport has lost business to road transport.

In the mid-1990s, in the course of the change of the political and economic system, insufficiently qualified people have been put into positions at management level of the rail tansport company.

Major public and private stakeholders in the transport industry set up an initiative to get freight from road to rail. The government plans to shift freight back from road to rail. The government is keen on improving rail transport performance in order to reduce freight volume on roads. It is, however, not clear when the plans of the government begin to take effect. The current rail transport system does not have the capacity to absorb a significant shift of freight from road to rail transport. There is a lack of infrastructure and equipment on both domestic as well as cross-border transport.

The rail transport company is aware of the weaknesses of the rail transport system and is busy implementing measures for improvement. The rail transport company set

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211   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-14	ZA-02-19	ZA-05-17	ZA-07-09	ZA-07-10	ZA-08-09
ZA-09-20	ZA-09-22	ZA-10-05	ZA-10-17	ZA-10-19	ZA-14-08
ZA-14-10	ZA-31-18	ZA-31-19	ZA-37-21	ZA-37-22	ZA-37-24
ZA-37-28	ZA-37-29	ZA-41-13	ZA-41-14	ZA-41-15	ZA-41-16
ZA-41-17	ZA-41-26				

up a massive investment programme for the rail transport system; however, a temporary lack of funds caused delays.

Rail transport needs to redefine its role in the supply chain.

Only if there are significant improvements in rail infrastructure, equipment and efficiency, will freight shift from road to rail transport. Because of the necessary investments in rail transport infrastructure and equipment as well as the lack of funds, it will take ten to 15 years to shift significant volumes back from road to rail. This not only applies to South Africa but to many southern African countries as well.

In 2005, the management of the rail transport company embarked on a new strategy. The new strategy is reasonable; but the strategy and implementation come too late.

In 2012, a new strategy for rail transport in South Africa was set up. The strategy aims at achieving a higher fit between the services of the rail transport company and the needs of the customers, at retrieving business volume from road to rail as well as at investing adequately in infrastructure and rolling stock. Since 2012, the rail transport company started to put the customer at the centre of its perspective and aligned their key performance indicators accordingly. Since then, the rail transport company has improved in terms of customer satisfaction with rail transport services. Provided that the rail transport company continues to improve the rail transport system, in about ten years the rail transport performance will be much higher than today. Currently, the new strategy is being implemented.

A major area for improvement will be digitisation of the rail transport system in the future. The strategy is currently complemented by plans to increase digitisation in the rail transport system.

The necessary plans to improve the rail transport performance exist in South Africa. It lacks implementation. The speed of implementation is not sufficient. In addition, orders are awarded to insufficiently qualified companies.

The government is investing in the rail transport system. The amount of investment is, however, not sufficient. A lack of funds hinders higher amounts of investments. In order to allow the necessary investments in rail transport, private sector participation is necessary.

The level of maintenance and development of the rail transport system is insufficient. There is a lack of investment in the rail transport system. Not enough investments are

going into the rail transport system. The level of investment is still too low. As stated earlier, others state that an improvement in rail transport performance is not visible.

Other inteviewees oppose that the rail transport company invested significantly in the rail transport system. The rail transport company is investing in infrastructure and rolling stock as well as striving to increase the efficiency of the existing rail transport system to get to the envisioned freight volume of 350 million tonnes per annum in 2019.

In order to improve rail transport performance, there is a need for organisational improvements at the rail transport company.

Ownership and operating structure

This section presents the core statements on ownership and operating structure.[212]

The railway infrastructure and operations are publicly owned, managed and operated. There is no participation of the private sector, not even in rail transport operations.

Whilst road transport services are privately operated, rail transport services are publicly provided. It is exactly the ownership and management model that explains the differences in performance between road and rail transport performance.

The shift from road to rail will not happen unless public and private foreign investors are willing to financially support investments in the rail transport system in countries in southern Africa. Because of opportunities to benefit from corruption and the history of African countries, governments on the African continent want to keep control of the entire rail transport system. If the government of South Africa would be willing to let other countries participate, some countries would probably be interested in doing so.

A private company would run the rail transport system in South Africa much more efficiently and at lower costs. A private company should be responsible for providing efficient rail transport services and maintaining the infrastructure in exchange for participation in revenues from transport services and provision of rail infrastructure. The

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212   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-20	ZA-02-06	ZA-02-20	ZA-02-21	ZA-02-22	ZA-03-14
ZA-03-21	ZA-07-11	ZA-07-13	ZA-31-19	ZA-37-24	ZA-37-25
ZA-37-26	ZA-37-27	ZA-37-30	ZA-38-06	ZA-38-10	ZA-41-22
ZA-41-23					

population would benefit from lower transport costs and, consequently, lower costs of goods.

The opening up of the rail transport sector in South Africa would allow the private sector to participate. This would create some competition and strengthen performance.

There is a need for private sector participation in the rail transport system.

The rail transport company as well as its customers are responsible for improving the rail transport system. The private sector should get involved and could contribute to an increase in transport performance as well.

The rail transport company should be split up into its divisions and the rail freight devision should be privatised.

To ensure necessary improvements, the rail transport company is pursuing public-private partnerships.

A strategy for public-private partnership has been defined in South Africa. The operation of the infrastructure and transport operations should be separated. Whilst the infrastructure should be publicly owned and managed, the operations should be run under licence by the private sector. However, the unwillingness of the private sector to give up control may represent an obstacle.

The rail transport company and the government are promoting private sector involvement by means of public-private partnerships. The first and last mile as well as transhipment centres lend itself towards private sector involvement. Branch lines could be upgraded and operated by the private sector. The provision and operation of the main lines is a significant contributor to the employment situation in South Africa and it is a responsibility of the public sector to keep employment levels high. For this reason, the provision and operation of main lines should remain under the responsibility of the public sector.

A political unwillingness to create competition in the rail transport sector represents an obstacle to improvements in rail transport performance. The improvement programme is, however, constrained by a lack of public funds. The government is not in favour of a full or partial privatisation of the rail transport system. The opposition parties have questioned the unwillingness of the government to allow private sector participation in rail transport for long time. Despite the unprofitability of the rail transport system, the government will not change its approach.

The Chinese investment strategy in infrastructure in countries on the African continent raises concerns. Chinese companies only invest in infrastructure that allows them to obtain the resources they need for their economy, irrespective of the consequences on the countries on the African continent. However, the foreign direct investment strategy of South Africa is different and will not expose the country to such a high risk.

Because of the public ownership and management model of rail transport in South Africa, the government is responsible for improving the rail transport performance. However, the unwillingness to create competition in rail transport in South Africa represents an obstacle to improvements in rail transport performance in South Africa.

Cross-cutting issues

This section presents the core statements on cross-cutting issues.[213]

Freight should be shifted from road to rail. Many products lend themselves to rail transport, such as bulk and containerised freight. Much more containerised cargo could be transported by rail transport. There is a need for investments in the rail system for rail-friendly goods, such as copper. Other interviewees state that rail transport faces fierce competiton with road transport up to 600 km. Whilst the costs are similar, the higher transport performance makes road transport the preferred mode. Yet other interviewees state that distances in South Africa exceed the recommended length for road transport and are below the recommended minimum length for rail transport and consolidation. This situation of being caught between maximum and minimum distances represents an obstacle to the adequate use of rail transport in South Africa. Other interviewees plead, however, that in other countries, examples of a well-performing rail transport system even at lower distances exist. Hence, it should be possible to make rail transport keep up with other transport modes in South Africa.

A decline in the demand for commodities may represent an obstacle. Unless a decline in commodities becomes a reality, there are no obstacles to improvements in rail transport performance.

It is difficult to finds good examples in the supply chain sector on the African continent that South Africa could look at and learn from. Good examples can rather be found in

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213   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| ZA-02-16	ZA-07-14	ZA-07-15	ZA-14-03	ZA-14-07	ZA-31-17
ZA-37-05	ZA-41-24	ZA-41-25			

Europe. Rail transport works well in Germany, for instance rail transport of finished vehicles from inland manufacturing locations to seaports. That is a good example for South Africa to look at.

Importance and Performance of rail transport network attributes

Figure 6-14 illustrates the average relative importance values[214] of rail transport network attributes across countries as well as the average performance values[215] of these attributes in South Africa. To recap, four respondents evaluated the importance of rail transport network attributes. Only one respondent rated the performance of rail transport network attributes in South Africa. Due to the low number of respondents, the questionnaire and the personal interview results should be analysed coherently in order to provide a meaningful picture.

To give an overview, the respondent assigned a good to fair rating to rail transport performance in South Africa.[216] The respondent assigned a fair to poor rating to transshipment centres, a good to fair rating to infrastructure, transport operations as well as public policies and services, and a good rating to equipment and facilities – in ascending order. With this overview in mind, this section now presents the details by attribute.

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214   For ease of interpretation and analysis, the average relative importance values have been translated into verbal expressions, by means of the following scheme: standard deviation (σ) = 9.0 %; mean (μ) = 20 %; μ - 1σ = 11.0 %; μ + 1σ = 29.0 %

    $\mu + 1\sigma \ < \ x \ \leq \ 100\,\%$ High
    $\mu \ \ \ \ \ \ \ < \ x \ \leq \ \mu + 1\sigma$ Medium to high
    $\mu - 1\sigma \ \leq \ x \ < \ \mu$ Medium to low
    $0\,\% \ \ \ \ \ \leq \ x \ < \ \mu - 1\sigma$ Low

215   For ease of interpretation and analysis, the average degree of agreement values have been translated into verbal expressions, by means of the following scheme:

    1.0 – 2.4   Strong agreement   Good
    2.5 – 3.4   Slight agreement   Good to fair
    3.5 – 4.4   Slight disagreement   Fair to poor
    4.5 – 6.0   Strong disagreement Poor

216   The mean value and standard deviation across all five attributes of rail transport network performance in South Africa is 3.0 and 0.7, respectively.

Figure 6-14: Importance and Performance – Rail Transport South Africa
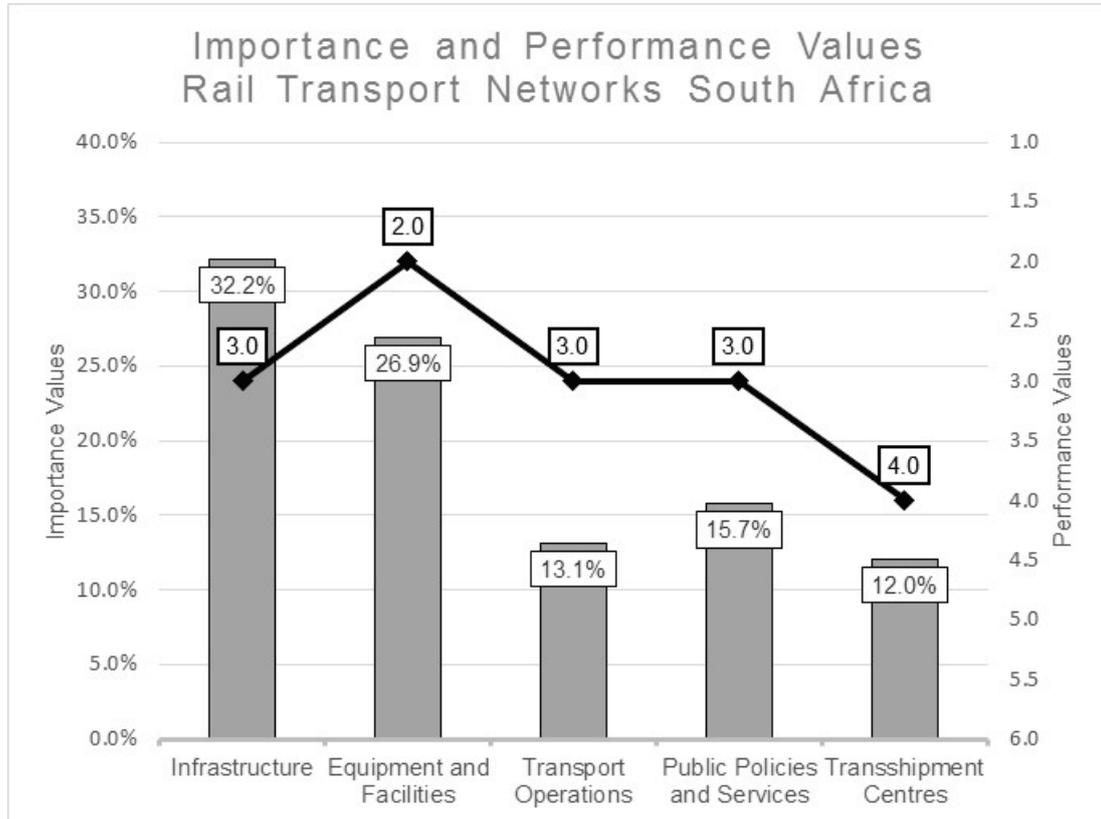
First, the "equal weight" procedure is applied.[217] This procedure yields the following picture and leads to the following conclusions.

Respondents assigned a high importance (32.2 %) as well as a good to fair performance (3.0) to infrastructure. The high importance argues for a higher than good to fair performance. Thus, the infrastructure seems to represent a constraint to rail transport performance in South Africa.

Respondents assigned a medium to high importance (26.9 %) as well as a good performance (2.0) to equipment and facilities. The medium to high importance would justify an even lower performance. Thus, the equipment and facilities do not seem to represent a constraint to rail transport performance in South Africa.

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217   The "equal weight" procedure gives an equal weight to the importance and performance component, as described in section 6.3.1.1 on page 158.

Respondents assigned a medium to low importance (13.1 %) as well as a good to fair performance (3.0) to transport operations. The medium to low importance would justify an even lower performance. Thus, the transport operations do not seem to represent a constraint to rail transport performance in South Africa.

Respondents assigned a medium to low importance (15.7 %) as well as a good to fair performance (3.0) to public policies and services. The medium to low importance would justify an even lower performance. Thus, the public policies and services do not seem to represent a constraint to rail transport performance in South Africa.

Respondents assigned a medium to low importance (12.0 %) as well as a fair to poor performance (4.0) to transhipment centres. The medium to low importance goes in line with a medium to low performance. Thus, the transhipment centres do not seem to represent a constraint to rail transport performance in South Africa.

Second, the "higher weight towards performance" procedure is applied.[218] This procedure yields the following picture and leads to the following conclusions: Transhipment centres received the lowest performance value. Thus, transhipment centres seem to represent a constraint to rail transport performance in South Africa.

Consequently, all in all, infrastructure and transhipment centres seem to represent constraints to rail transport performance in South Africa.

6.3.3.4 Manufacturing Locations

The statements on manufacturing locations are sorted according to the following sections, namely, manufacturing location performance, economic geography, transport system, local currency, education and workforce, electricity supply, water supply, public regulation, cost competitiveness as well as cross-cutting issues. The presentation of statements in categories is followed by the presentation and interpretation of combined importance and performance values of manufacturing location attributes.

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218   Provided that an attribute is important, irrespective of the actual level of importance, the "higher weight towards performance" procedure gives a higher weight to the performance component, as described in section 6.3.1.1 on page 159.

Manufacuturing location performance

This section presents the core statements on manufacturing location performance.[219]

Manufacturing location performance is poor.

Poor manufacturing location performance can be traced back to various factors.

Other interviewees state that the manufacturing performance is highest in South Africa among southern African countries.

The automobile industry performs very well in South Africa and their plants rank among the best worldwide. This indicates that companies in South Africa are able to produce goods of fair and good quality and are able to be competitive at world-class level. The supporting environment provides the necessary performance to allow for and support vehicle production in South Africa. The adherence of the automobile industry to their locations in South Africa is an indicator of the good performance of manufacturing locations in South Africa.

Yet other interviewees state that the location of South Africa is well suited to manufacturing operations, although some weaknesses exist. Other interviewees state that the basic requirements of manufacturing locations can be fulfilled throughout South Africa. The cost structures are, however, different.

There are, however, doubts about the country's ability to keep its relative strength. It is only a question of time until other countries in southern Africa catch up. The superior importance of the economy of South Africa is at risk.

The importance of the manufacturing industry in South Africa is decreasing.

Economic geography

This section presents the core statements on the economic geography.[220]

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219   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-05-18	ZA-05-21	ZA-09-25	ZA-10-21	ZA-11-02	ZA-16-01
ZA-31-04	ZA-31-20	ZA-38-12	ZA-38-14	ZA-40-22	

220   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-07-07	ZA-09-24	ZA-10-19	ZA-10-21	ZA-10-27	ZA-10-28
ZA-12-03	ZA-12-08	ZA-12-11	ZA-12-12	ZA-12-13	ZA-14-03
ZA-31-01	ZA-31-20				

In contrast to geographically similar countries, some major economic centres in South Africa are located at the interior of the country without any direct sea or river access. Many manufacturing locations in South Africa are far away from the main markets. For instance, for the Gauteng province to link up with maritime transport networks, there is a need for an additional 600 kilometer pre- or on-carriage. The high transport distances between ports and economic centres in the hinterland cause high transport costs and increase the costs of manufacturing locations and supply chains in South Africa. The high distances put manufacturing locations at a disadvantage in international competition among manufacturing locations and companies. High transport distances represent a major constraint in South Africa. However, the high performance of transport companies alleviates weaknesses in economic and transport geography.

The high distance to the main markets, the high distance to skilled labour as well as high distance to sources of supply explain the poor manufacturing location performance.

In order to improve manufacturing location performance of South Africa, future economic centres should be located at the coast.

The main challenge of the manufacturing industry is the high geographical concentration. Manufacturing companies in South Africa are clustered around sources of supply. The government needs to provide a regulatory framework that attracts companies to less agglomerated areas. The government needs to bring the relevant stakeholders together to ensure that there is an understanding of the potential locational advantages.

There is a need to set up clusters that comprise company locations, transport infrastructure, educational entities, residential districts as well as shopping facilities. Stakeholders could include local and national government, public authorities as well as companies. Actions could include financial incentives, public infrastructure, improvements in public administration services as well as labour regulation. The public sector is responsible for initiating actions and needs to bring the private sector in to set up and run businesses.

Transport system

This section presents the core statements on the transport system.[221]

The low productivity of ports in South Africa places a burden on manufacturing companies that rely on import goods. Insufficient productivity leads to deficiencies in goods availability, increases the costs of imports and, eventually, reduces the competitiveness of companies and supply chains in South Africa.

Manufacturing companies are dependent on a transport system that supports their manufacturing system. There are, however, significant constraints in the transport system.

The costs to bring goods to markets represent a challenge in South Africa.

The performance of the rail transport system is not sufficient to support well-performing manufacturing companies adequately. In order to foster competition in the transport market in South Africa, companies use and contribute to the strengthening of alternative transport modes, such as rail transport on the Maputo Corridor.

Companies need a transport system that supports their manufacturing performance.

Other interviewees state that manufacturing companies in South Africa have good access to domestic and international transport networks. The good access to transport networks is a major contributor to the good performance of manufacturing locations. Yet other interviewees state that the transport system is sufficient to support manufacturing locations in South Africa; nonetheless, weakenesses in transport exist.

The transport system is sufficient to support manufacturing locations. High distances to ports are compensated by well-performing transport companies.

Corruption at border crossings increases the costs of goods and places a burden on manufacturing companies. People are often not aware of the effects of their corrupt behaviour.

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221   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-03-10	ZA-05-18	ZA-09-25	ZA-11-03	ZA-13-13	ZA-37-11
ZA-38-10					

In order to improve the manufacturing location performance of South Africa more freight should be shifted to rail transport and for the freight that remains on roads, road transport needs to be made more efficient.

Local currency

This section presents the core statements on the local currency.[222]

The sustained low value of the currency of South Africa against major international currencies increases import costs. Higher import costs increase the costs of local production as well as reduce the cost competitiveness of import-reliant manufacturing companies in domestic as well as foreign markets.

Because the weakness of the local currency does not only affect manufacturing locations, but the other supply chain domains as well, a comprehensive analysis of the deficiencies of the local currency follows in section 6.3.3.5 on the supply chain system of South Africa.

Education and workforce

This section presents the core statements on education and workforce.[223]

Despite high unemployment, labour costs are high in South Africa. In the past, the unit labour costs represented a competitive advantage for manufacturing locations in South Africa; but today the labour cost advantage does not exist anymore. Whilst labour costs increase, productivity remains the same. Labour costs increase disproportionally in relation to labour productivity.

Increasing unit labour costs increases the costs of production in South Africa. High labour costs impede the competitiveness of the economy.

The manufacturing location in South Africa competes with manufacturing locations in countries worldwide. Labour costs are, however, higher in South Africa than in other

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222   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-04	ZA-01-22	ZA-10-25	ZA-12-07	ZA-12-09	

223   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-04	ZA-10-23	ZA-10-26	ZA-11-01	ZA-11-02	ZA-11-05
ZA-11-06	ZA-11-07	ZA-11-10	ZA-11-13	ZA-12-06	ZA-31-03
ZA-38-13	ZA-38-15	ZA-40-20	ZA-40-21	ZA-40-22	

countries, such as China and India. If labour costs in China and India converge to the level of labour costs in South Africa, and if other deficiencies, such as shortages in electricity supply, are sorted out, the attractiveness of the location will increase.

There is a shortage of skilled labour to run daily operations. There is a lack of semi-technical and technical skills. There is a lack of skilled labour to run advanced businesses. Other interviewees state that their companies have access to a sufficient number of skilled staff and skilled labour supply does not represent a constraint to their company performance. Yet other interviewees remark that the supply of skilled labour for industrial manufacturing is still ensured, albeit barely.

The frequency and duration of labour strikes is much higher in other countries. Frequent labour strikes and high labour costs create uncertainty for companies, which are considering setting up a location in South Africa as well as established companies.

Since the 1960s, the government supported economically less developed areas and promoted industry locations far away from economic centres. These measures only focussed on promotion of industry location and neglected a holistic approach to location development. The high distance of skilled labour and an insufficient development of closeby residential areas to manufacuturing locations contribute to the poor performance of manufacturing locations.

An insufficient supply of skilled labour along with strict, employee-biased labour laws impede the performance of manufacturing companies. If skills were better and productivity higher, the performance of manufacturing companies could be even higher.

Because deficiencies in education and workforce do not only affect manufacturing locations, but the other supply chain domains as well, a comprehensive analysis of deficiencies in education and workforce follows in section 6.3.3.5 on the supply chain system of South Africa.

Electricity supply

This section presents the core statements on electricity supply.[224]

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224   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| ZA-11-08 | ZA-31-20 | ZA-38-15 | ZA-38-16 | | |

In the past, there were shortages in power supply; this has, however, been sorted out. Significant funds have been spent to improve electrical infrastructure of the country and this needs to be continued. If shortages in electricity supply – along with other deficiencies – are sorted out, the attractiveness of the location will increase.

Competitive cost of energy supply represents a major determinant on the performance of manufacturing locations. Electricity has to be provided at reasonable cost.

Because deficiencies in electricity supply do not only affect manufacturing locations, but other supply chain domains as well, a comprehensive analysis of deficiencies in electricity supply follows in section 6.3.3.5 on the supply chain system of South Africa.

Water supply

This section presents the core statements on water supply.[225]

The semi-arid climate in South Africa makes water a scarce resource and places a burden on water-intensive industries in South Africa.

Public regulation

This section presents the core statements on public regulation.[226]

The government does not do enough to strengthen manufacturing sectors that make a considerable contribution to the manufacturing industry in South Africa, such as the automobile industry. The government just maintains the current state of development.

Other interviewees state that the government tries to attract companies by providing various benefits, such as tax discounts and industrial zones. Yet other interviewees remark that the public subsidies are a major reason why the automobile industry still sticks to its locations in South Africa.

Strained relations between the public sector, private sector as well as labour create uncertainty in the business environment and hinder private long-term investments in

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225   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-31-20					

226   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-25	ZA-03-22	ZA-10-22	ZA-11-08	ZA-11-12	ZA-11-13
ZA-12-05					

manufacturing locations. Because of the uncertain business environment, companies rather import than put their finance at risk.

The government made financially unattainable promises to the population, which caused compromises in critical public infrastructure and led to tax increases. In the past, investments in areas that directly support the economy have been neglected. The following governments need to strike a balance between spending on social areas and spending on economic areas.

There is a need for elimination of unreasonable disadvantages that the affirmative action programme places on established companies.

Cost competitiveness

This section presents the core statements on cost competitiveness.[227]

The manufacturing industry is subject to fierce cost competition, both in domestic as well as foreign markets.

Increasing taxes and unit labour costs increase the costs of manufacturing in South Africa. Manufacturing companies in South Africa find theirselves in fierce cost competition against foreign manufacturing companies, both on domestic as well as foreign markets.

Cross-cutting issues

This section presents the core statements on cross-cutting issues.[228]

Manufacturing companies will establish locations in South Africa if the supporting environment supports it. This includes the logistics environment, and, even more important, supply of electricity, water, labour and communication services. These packages of services are particularly provided in industrial development zones in South Africa.

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227   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-10-24	ZA-11-10				

228   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-31-21	ZA-38-14	ZA-38-17	ZA-40-18		

Other interviewees state that the supporting environment, i.e. transport infrastructure, manufacturing facilities, suppliers, access to road, rail and air transport networks, communication system, legal and financial system as well as a sufficiently skilled workforce make their contribution to the good manufacturing performance in South Africa. All factors that are necessary to produce at high global performance levels are available in South Africa. The supporting environment for manufacturing locations is much better than in the other countries in southern Africa. Nonetheless, some weaknesses in the manufacturing location exist in South Africa.

Irrespective of the various challenges that the country faces, the country needs to make a decision on its economic strategy. First, the country needs to decide whether the economy is geared towards resource extraction and export or towards industrial manufacturing. Second, the country needs to decide whether the economy is positioned as superior or equal to the other economies in southern Africa. These two decisions decide how the economy of South Africa should be designed in the future.

The business environment in Germany contributes to the good performance of companies and is a good example for South Africa to look at. This includes the interplay of public policies, labour and labour unions as well as companies. Although the country has not achieved that level yet, South Africa is moving towards it.

Importance and performance of manufacturing location attributes

Figure 6-15 illustrates the average relative importance values[229] of manufacturing location attributes across countries as well as the average performance values[230] of these attributes in South Africa. To recap, three respondents evaluated the im-

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229   For ease of interpretation and analysis, the average relative importance values have been translated into verbal expressions, by means of the following scheme: standard deviation (σ) = 9.2 %; mean (μ) = 20 %; μ - 1σ = 10.8 %; μ + 1σ = 29.2 %

μ + 1σ < x ≤ 100 %   High
μ < x ≤ μ + 1σ Medium to high
μ - 1σ ≤ x < μ Medium to low
0 %   ≤ x < μ - 1σ Low

230   For ease of interpretation and analysis, the average degree of agreement values have been translated into verbal expressions, by means of the following scheme:

1.0 – 2.4   Strong agreement   Good
2.5 – 3.4   Slight agreement   Good to fair
3.5 – 4.4   Slight disagreement   Fair to poor
4.5 – 6.0   Strong disagreement   Poor

portance of manufacturing location attributes. Only three respondents rated the performance of manufacturing location attributes in South Africa. Due to the low number of respondents, the questionnaire and the personal interview results should be analysed coherently in order to provide a meaningful picture.

To give an overview, respondents assigned a good to fair rating to manufacturing location performance in South Africa.[231] Respondents assigned a poor rating to public policies and services, a fair to poor rating to local infrastructure, and a good rating to economic agglomeration, transport network accessibility as well as manufacturing sites – in ascending order. With this overview in mind, this section now presents the details by attribute.

Figure 6-15: Importance and Performance – Manufacturing Locations South Africa
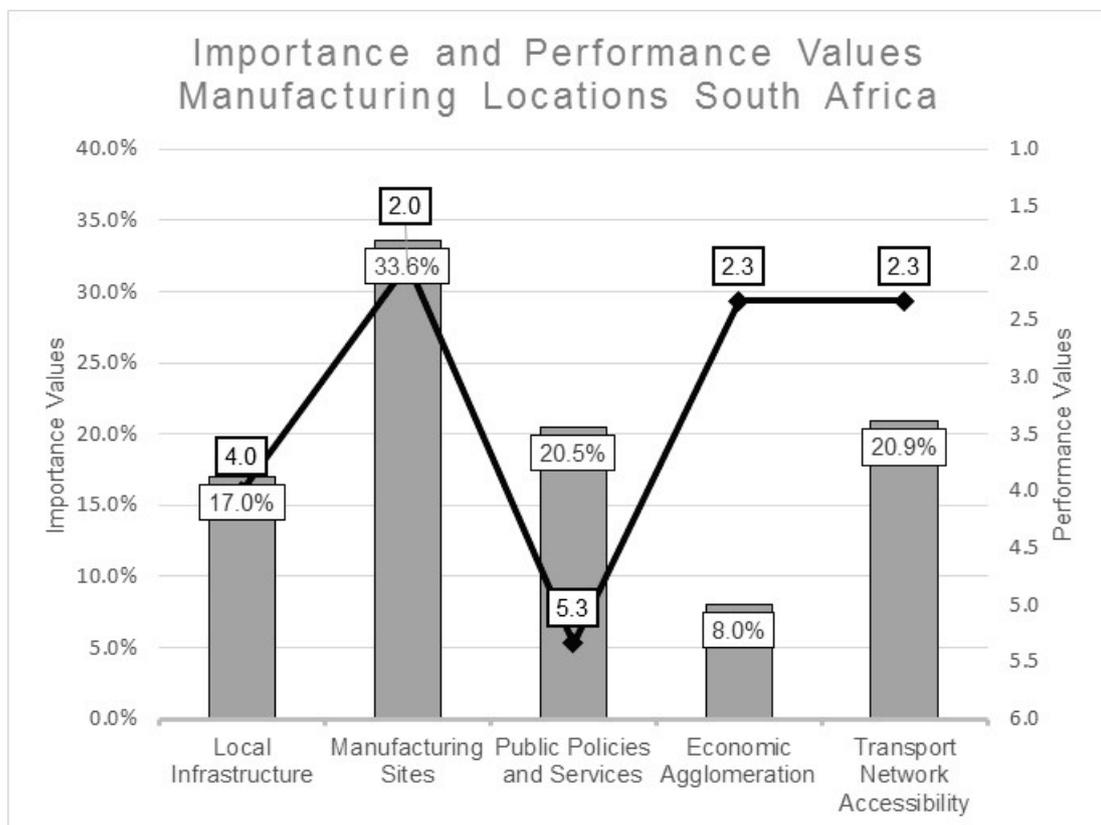
First, the "equal weight" procedure is applied.[232] This procedure yields the following picture and leads to the following conclusions.

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231   The mean value and standard deviation across all five attributes of manufacturing location performance in South Africa is 3.2 and 1.4, respectively.

232   The "equal weight" procedure gives an equal weight to the importance and performance component, as described in section 6.3.1.1 on page 158.

Respondents assigned a medium to low importance (17.0 %) as well as fair to poor performance (4.0) to local infrastructure. The medium to low importance justifies a fair to poor performance. Thus, the local infrastructure does not seem to represent a constraint to manufacturing location performance in South Africa.

Respondents assigned a high importance (33.6 %) as well as a good performance (2.0) to manufacturing sites. The high importance justifies a good performance. Thus, the manufacturing sites do not seem to represent a constraint to manufacturing location performance in South Africa.

Respondents assigned a medium to high importance (20.5 %) as well as a poor performance (5.3) to public policies and services. The medium to high importance argues for a much higher than poor performance. Thus, the public policies and services seem to represent a constraint to manufacturing location performance in South Africa.

Respondents assigned a low importance (8.0 %) as well as good performance (2.3) to economic agglomeration. The low importance would justify a much lower performance. Thus, the economic agglomeration does not seem to represent a constraint to manufacturing location performance in South Africa.

Respondents assigned a medium to high importance (20.9 %) as well as good performance (2.3) to transport network accessibility. The medium to high importance would justify a slightly lower performance rating. Thus, the transport network accessibility does not seem to represent a constraint to manufacturing location performance in South Africa.

Second, the "higher weight towards performance" procedure is applied.[233] This procedure yields the following picture and leads to the following conclusions: Public policies and services received the lowest performance value. Thus, public policies and services seem to represent a constraint to manufacturing location performance in South Africa.

Consequently, all in all, public policies and services seem to represent a constraint to manufacturing location performance in South Africa.

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233   Provided that an attribute is important, irrespective of the actual level of importance, the "higher weight towards performance" procedure gives a higher weight to the performance component, as described in section 6.3.1.1 on page 159.

6.3.3.5 Supply Chain System

The statements on the supply chain system are sorted according to the following sections, namely, development of supply chains, local currency, electricity supply, education and workforce, public services, public regulation, corruption as well as public finance.

Development of supply chains

This section presents the core statements on the development of supply chains.[234]

Logistics performance in South Africa is below logistics performance of developed countries. Logistics performance in South Africa deteriorated compared to developed countries. Nonetheless, it is above logistics performance of developing countries and above southern African countries. Logistics performance in South Africa is similar to Australia.

Because of insufficient rail transport performance and resulting higher transport costs, logistics performance is not as good as major global comparative indicators suggest.

In the past, South Africa was regarded as the gateway to the African continent. That is still valid today; the country is still the gateway to the African continent. A number of factors that determine supply chain performance are best in South Africa among southern African countries. South Africa has always been the port of entry and always played a superior role in southern Africa. Because most cargo to southern Africa is imported through ports in South Africa and carried to the hinterland countries in the SADC, the economy of South Africa had the chance to grow big. The economy and supply chain system are much more advanced than the other economies. The economic isolation during the apartheid period forced the country to become self-sufficient. The revenues from mineral exports allowed the country to invest in infrastruc-

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234   Reference table to the appendix publication, as explained in footnote 83 on page 146.

SA-06-01	SA-06-02	SA-06-03	SA-06-04	ZA-01-01	ZA-02-01
ZA-02-02	ZA-02-13	ZA-05-01	ZA-05-02	ZA-05-03	ZA-05-08
ZA-05-09	ZA-07-01	ZA-07-02	ZA-07-04	ZA-08-10	ZA-09-01
ZA-09-02	ZA-09-06	ZA-09-07	ZA-09-08	ZA-09-09	ZA-09-12
ZA-10-01	ZA-12-10	ZA-14-01	ZA-14-02	ZA-16-01	ZA-31-01
ZA-31-02	ZA-31-05	ZA-37-01	ZA-37-04	ZA-37-05	ZA-37-08
ZA-39-01	ZA-40-01	ZA-40-03	ZA-40-22		

ture. The well-developed financial system allows the country to fund large infrastructure projects. The country did not have any wars on its own territory – in contrast to other countries. The opening up of the economy after apartheid exposed the economy to international competition. The country is politically and economically stable. The legislative and judiciary system are well developed. The information and communication system is well developed. Economies of scale are much higher than in other countries in southern Africa. Companies are not only familiar with doing business in their own country, but they do business in other countries on the African continent as well. For these reasons, supply chain performance is high in South Africa. All these factors contribute to the high supply chain performance of South Africa.

Apart from rail transport, the logistics system does not provide any room for improvement. There are no major concerns about supply chain performance in South Africa. Other interviewees plead, however, that there are capacity constraints in seaports, road transport and energy supply. The national freight plan was only a start and not enough progress has been achieved in seaports, rail transport and pipelines. The economy did not meet the envisioned objectives.

From 2004 to 2016, the state of logistics performance remained mostly unchanged in absolute terms. From 2004 until 2016, the country has kept its position in performance of the economy compared to other countries; there was neither relative progress nor deterioration. However, the economic situation stagnates. Other interviewees state that during the last two decades, the economy got weaker. Since the end of the apartheid period, the country should have reached the level of a politically and economically very well developed country. However, the country is far away from this objective. The economy has not met the envisioned objectives.

Further improvements in port, road and rail transport would allow South Africa to increase cargo volume. That, however, requires governmental willingness and funds.

There is a need to reduce the total costs of doing business in South Africa; this implies a higher integration along the supply chain.

The future development of supply chains in South Africa will depend on the development of the other economies in southern and eastern Africa. Up to now, the weakness of the other economies in manufacturing contributes to the strength in manufacturing and exporting of South Africa. If the other countries develop their own manufacturing industries, e.g. agriculture and vehicle manufacturing, the manufacturing and export

industry in South Africa will face competition. Other SADC countries have already started to diversify their economies and attract manufacturing industries.

Currently, it is often much quicker to import goods through ports in South Africa and its cross-border transport corridors compared to alternative ports, which are geographically closer to the destination. However, because other countries in southern Africa are establishing their own transport corridors, such as Namibia and Mozambique, and other economies are becoming more important and more independent, there is a risk that the importance of South Africa as a gateway and major supplier will reduce. Other interviewees state that because other countries are catching up in terms of development of their economies and supply chain performance, the relative strength and importance of South Africa will decrease in the future. Yet other interviewees remark that because of favourable import duties to other SADC countries and the large manufacturing industry in South Africa, South Africa will remain a major supplier for SADC countries.

New transport corridors are emerging in the northern part of southern Africa as well as east Africa, such as Angola and Tanzania, which will provide alternatives and competitors to established transport corridors in South Africa. New alternatives will cause a shift in transport volume from South Africa to the north of southern Africa.

There are only very few good examples of supply chain performance on the African continent that South Africa should look at and learn from. Good examples can rather be found in Europe.

Strategies and the necessary knowledge to further improve the rail transport system exist in South Africa.

The government is responsible for adapting the transport system of South Africa.

Local currency

This section presents the core statements on the local currency.[235]

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235   Reference table to the appendix publication, as explained in footnote 83 on page 146.

| ZA-01-04 | ZA-11-08 | ZA-12-09 | ZA-12-12 | ZA-37-02 | ZA-37-03 |

The sustained weakness of the local currency increases the costs of imports. Due to the high transport distances, higher costs of fuel imports for road transport significantly increase the costs to companies.

Because monetary transactions in many countries in the SADC are made in US-Dollars, the weakness of the Rand against the US-Dollar makes imports from South Africa less cost-intensive. The favourable exchange rate for imports to other SADC countries contributes to South Africa's role as a major supplier to the SADC.

There are plans to introduce a single currency among SADC countries. Because these countries are even more diverse than countries of the euro zone, a single currency is economically not feasible in the SADC.

The government needs to stabilise the political situation in order to contribute to an appreciation of the local currency.

Electricity supply

This section presents the core statements on electricity supply.[236]

Electricity supply suffers from a lack of capacity.

As early as around 1900, there was a need of general infrastructure in South Africa. Infrastructure was well developed during the apartheid period and a good state of infrastructure was handed over to the new political and economic system. However, after 1994, the main emphasis of public spending was on residential infrastructure. Other critical infrastructure such as electricity for industry was neglected. Until 2004, the general infrastructure of the country was in a good state. Since then, general infrastructure, such as electrical infrastructure, has been deteriorating. Today, shortages in electricity supply force the economy to slow down. Similarly, other interviewees state that the government made financially unattainable promises to the population, which required compromises in critical public infrastructure. In the past, investments in the economy were neglected. The following governments need to strike a balance between spending on social areas and economic areas.

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236   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-05-02	ZA-05-22	ZA-10-01	ZA-11-08	ZA-13-01	ZA-13-02
ZA-13-03	ZA-31-20				

During the last years, there were shortages in power supply. These issues have, however, been sorted out.

Education and workforce

This section presents the core statements on education and workforce.[237]

Those people who are sufficiently qualified are too costly, whilst those people who are affordable are not suffiently qualified. In between there is a lack of adequately qualified and affordable people for daily business operations. Despite a large labour pool, labour costs are high compared to developing countries. Labour cost increases are higher than increases in labour productivity.

The need of many people to financially support relatives is a major reason for high labour costs in South Africa. Income inequality is relatively high, among the highest worldwide.

Basic and professional education of the wider population is insufficient. Many people have never attended school or university. There is a lack of skilled labour. There is enough labour, but people are not sufficiently skilled. Other interviewees state that there is a need of higher economic growth in order to create job opportunities.

Vocational eduction does not exist in South Africa. The lack of vocational education explains the lack of skilled labour to run daily operations. Education and training need to improve.

There is progress in education and economic wealth, especially in the group of previously disadvantaged people. However, too many graduates still do not meet the requirements of the labour market. It will take many years to make up this skill shortage.

High labour costs impede the competitiveness of the economy of South Africa.

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237   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-02	ZA-01-04	ZA-03-01	ZA-03-02	ZA-03-03	ZA-03-04
ZA-03-05	ZA-05-12	ZA-07-03	ZA-09-11	ZA-10-23	ZA-11-02
ZA-11-05	ZA-11-06	ZA-11-10	ZA-11-11	ZA-11-13	ZA-11-16
ZA-12-06	ZA-12-14	ZA-13-05	ZA-13-06	ZA-31-03	ZA-37-11
ZA-38-04	ZA-38-17	ZA-40-10	ZA-40-20	ZA-40-21	ZA-40-22

The frequency of violent and long-lasting labour strikes is high in South Africa. Recently, the frequency of industrial actions increased. The employee-friendly labour laws provide room for industrial action.

High protection of employees makes it more difficult to hire new staff. Labour unions prevent balancing mechanisms between demand for and supply of labour. Labour unions try to enforce even higher demands, cause labour strikes and, thereby, harm the attractiveness of the location. Interviewees criticise that only if public subsidies are granted, will the country become attractive for companies to set up a location.

By means of improvements in the quality of education entities and teachers, the quality of education should be increased. Other interviewees state that the necessary education entities exist in South Africa. However, few people can afford the education offerings. The inability to pay tution fees keeps many people from making use of education offerings. Currently, companies are helping to alleviate the gap between demand and supply of skilled labour. In order to find the right staff, business associations and companies provide the necessary basic and professional education.

Instead of industrial action, agreements between employees and employers are necessary. The labour market needs to be stabilised. There is a need for reductions in the frequency and duration of labour strikes. Alternatively, the use of technology needs to increase in order to alleviate the effects of labour strikes. Currently, despite frequent labour strikes and because of the high import costs, the spread of automation technology in the manufacturing industry is still low in South Africa.

The way the political and economic transition has been achieved in South Africa explains the way labour and labour unions represent their interests. People have learned that for things to change, they need to strike. In addition, the exploitation during the apartheid period caused suspiciousness among labour and labour unions on the one hand as well as the government and companies on the other hand.

The high power of labour unions creates business uncertainty and costs for companies. The power of labour unions may represent an obstacle to improvements in relations between employees and employers and to improvements in the labour market.

The affirmative action programme leads to inadequate staffing decisions. This, in turn, impedes the political and economic development in South Africa from realisation.

The lack of an adequate public transport system reduces the productivity of employees who have to get to work by public transport. Public transport has never played a

major role for governments in South Africa – neither for the apartheid nor for the post-apartheid governments. The public transport system rests upon an unregulated mini bus industry.

To reduce the skills gap, everyone needs education from an early age. All stakeholders are responsible for providing people with the necessary basic and professional education, i.e. individuals, companies, business associations, education entities as well as the government.

Strict, employee-friendly labour laws impede the development of the economy.

Relaxed labour laws would make it easier for employers to hire and – if employees do not meet the expectations – to dismiss employees. There are good examples of labour laws that facilitate job creation in other countries. The interplay between public policies, labour and labour unions as well as companies works well in Germany – that is an example that South Africa should look at.

In the mining sector, to stay competitive, the country needs to decide whether a lower number of employees should earn a higher wage or a higher number of employees should be employed.

Public services

This section presents the core statements on public services.[238]

Public service delivery is poor.

The transition from the apartheid period entailed a retirement of skilled people in public organisations. There was no proper transition from the former to the new political and economic system. The improper transition led to a collapse of the functioning of public organisations and public service delivery.This significantly constrained supply chain and economic performance in South Africa.

The affirmative action programme leads to inadequate staffing decisions at the governmental level. This negatively affects the performance of the public and private sector.

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238   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-02	ZA-09-11	ZA-10-02	ZA-10-03	ZA-11-14	ZA-13-04
ZA-40-22					

Other interviewees plead that the public administrational system still works well.

Public services at the level of local governments need to improve. These services include roads, water and sanitation, electricity, law enforcement, prevention of crime and prosecution of traffic offences as well as invoicing of such services.

The government is responsible for guiding actions. The public and private as well as labour sector play in important role in the implementation.

Regulation on trade and transport

This section presents the core statements on regulation of trade and transport.[239]

Public policies are not conducive to transport performance. There is a lack of guidance at the Department of Transport. There is a lack of efficiency at the Department of Transport.

The trade legislation is not conducive to trade. By providing the necessary trade legislation governments should facilitade trade. However, the Mozambican government considers borders as a source of revenue and, thereby, impedes trade. Border post operations are inefficient and cause higher waiting times and additional costs.

Despite improvements, waiting times at border posts between South Africa and Mozambique are still high and vary significantly. A one-stop border post including an accelerated border control for pre-cleared goods could lead to further improvements. A reduction in the length and variability of border crossing duration, a reduction in costs of border crossings as well as corruption could be achieved by means of a one-stop border post. A one-stop border post would allow for major improvements. The set up of one-stop border posts between South Africa and Mozambique should be prioritised. To get a one-stop border post running, the legislation, infrastructure, necessary capacity in public services with regard to customs, health, immigration and security need to be provided. Because governments are major beneficiaries of trade facilitation, governments are responsible for driving one-stop border posts. Whilst the government should provide the legislation, the private sector should get involved in the provision of infrastructure as well as execution of border compliance controls.

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239   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-04-04	ZA-04-05	ZA-04-08	ZA-04-09	ZA-04-10	ZA-04-11
ZA-04-13	ZA-08-03	ZA-14-04	ZA-37-05	ZA-40-12	ZA-40-13

Unfortunately, often the government does not communicate sufficiently with relevant stakeholders before it takes actions in border regulations.

There are, however, a number of obstacles to open border posts. Because many countries in the SADC, such as Mozambique, necessitate income from cross-border trade, border posts cannot be abolished, such as in Europe. Border officials make use of border controls to their own benefit. Open borders would eliminate this additional source of income. Other interviewees add that a mind-set for open borders does not exist in southern Africa.

Corruption and a lack of willingness to realise one-stop border posts may impede the realisation of border posts. There is a need to make governments aware of these issues. There is a border management agency in South Africa. However, this agency focusses on ensuring security instead of facilitating cross-border trade.

Because cross-border logistics processes involve a variety of different people from different cultures, different educational backgrounds, and third parties, there is only incomplete visibility. There are too many factors outside the control of companies.

The request for informal payments, excessive waiting times as well as a lack of harmonisation of standards cause difficulties at border posts of neighbouring countries and increase the costs of transport.

Border post operations are inefficient and cause additional waiting time. This in turn causes additional transport costs.

Harmonisation of standards is still at the beginning in southern Africa; harmonisation of standards has been addressed for about 70 years in Europe.

However, there are improvements at border posts, such as at the Komatipoort border post to Mozambique. This indicates that the governments are serious about improvements at border posts.

Trade legislation should be conducive to trade.

According to international benchmarks, public policies in South Africa are very good.

Corruption

This section presents the core statements on corruption.[240]

Corruption is increasing in South Africa and increases the costs and risk of doing business in South Africa. Corruption is a major reason for the economic stagnation of South Africa.

There is corruption at borders, both the border of South Africa as well as the border of Mozambique. This leads to additional inspections and causes additional waiting time and costs. Corruption impedes cross-border trade. In order to reduce corruption at border posts, it is necessary to understand its root causes.

Corruption is a major problem in South Africa. Those people who are open for bribery are not aware of the effects of their behaviour. Corruption increases the logistics costs and thereby places a burden on manufacturing companies in South Africa.

There are examples of lower levels of corruption in other countries.

Public finance

This section presents the core statements on public finance.[241]

There is a high risk that major financial rating agencies reduce their credit rating for South Africa.

Political and economic stability

This section presents the core statements on political and economic stability.[242]

During the last two decades, the economy got weaker. The government does not provide the necessary stability and creates an uncertain business environment.

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240   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-02	ZA-04-10	ZA-09-04	ZA-11-08	ZA-11-15	ZA-11-16

241   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-38-05					

242   Reference table to the appendix publication, as explained in footnote 83 on page 146.

ZA-01-04	ZA-05-03	ZA-05-22	ZA-09-08	ZA-09-10	ZA-11-08
ZA-11-13	ZA-11-15	ZA-12-04	ZA-12-12	ZA-13-04	ZA-13-06
ZA-38-05	ZA-40-02	ZA-40-04	ZA-40-05	ZA-40-06	ZA-40-08

There is uncertainty about the future development of the economy. There is a lack of confidence in the economic policy of the government. Political instability is the biggest challenge. The lack of political leadership represents an obstacle. The current political leadership threatens the democratic system in South Africa. There is a need for a strong opposition. There is a need for a resolute leadership to reclaim political, economic and social stability.

The current ruling political party places too much value on their personal interests instead of public interests. Although there are significant shortcomings in the economy, there is no change in people's attitude and behaviour.

The government does not provide the necessary economic stability and thereby creates an uncertain environment.

Obstacles in the development of the economy may come from a lack of political leadership in the government.

The business environment increases the ease of doing business in South Africa. The business environment is much better than in other countries in southern Africa, such as Zimbabwe. The business environment in South Africa is similar to European countries. In the past, the business environment got weaker, but now it seems to be improving.

Other interviewees plead, however, that the policy framework is very good. South Africa is the most politically and economically stable country on the African continent.

The government needs to stabilise the political situation including a reduction of the inflation rate as well as stabilisation of the currency exchange rate.

The government is not aware of all the needs of the private sector.

The current lack of stability in the political and economic situation creates an unfavourable environment for companies to operate and invest. Companies will only invest in South Africa if their investment is likely to pay off.

In the past, investments in the economy have been neglected in favour of investments in social areas. The following governments need to strike a balance between public spending on social areas and economic areas.

The government terminated agreements on protection of investments with a number of countries unilaterally.

Although it is reasonable that the population wants to participate in the economic wealth of the country, the measures the government takes to achieve that participation are, however, inappropriate. The unreasonable disadvantages that the affirmative action programme places on established companies need to be eliminated. Foreign investors are not willing to accept new shareholders if there is a risk that the new shareholders may negatively interfere with the performance of their companies. The courts have not come to a decision yet whether companies can lose their affirmative action status if previously disadvantaged shareholders sell their shares to non-previously disadvantaged shareholders. There is a risk that the government even intensifies equity affirmative action measures. The government is willing to intensify its affirmative action programme. This would place an excessive burden on companies in South Africa, especially on small companies. The design of the affirmative action programme could sustainably impede local and foreign investment and thus be counterproductive to the development of the supply chain system of South Africa. Many companies rather close their locations in South Africa than sell the majority of the company.

The costs of affirmative action measures needs to be considered as additional costs of doing business in South Africa. Whilst large companies have alternatives on hand to alleviate effects from affirmative actions measures, small and medium sized companies cannot make use of alternative measures and have to accept negative effects on their business performance. Because of the risk, foreign companies do not invest in South Africa but rather spend their funds abroad.

A strategy for the future development of the economy has been put down. However, this strategy is too narrowly focussed on the mineral sector and the time horizon is too short.

Public programmes should be established to facilitate private company investments in capital-intensive infrastructure.

The business environment in Germany contributes to the good performance of companies and is a good example for South Africa to look at.

6.4 A Review of the Data Collection, Database and Analysis

Even though considerable care has been taken to design the data collection instruments and to collect the data, some results deserve attention before moving forward.

First, although a great deal has been put into identification and contacting as well as follow-ups with potential respondents, the number of questionnaire responses is low. The low number of responses implies that some importance and performance values cannot be calculated or rest on an insufficient number of responses to draw meaningful conclusions. An insufficient number is likely to result in a notable margin of error of calculated values and a high uncertainty in the derived meanings. Without dispute, this sets limits to the certainty of calculated values and, thus, to the feasible level of differentiation concerning the constraining effects of attributes. Therefore, the importance and performance values should be regarded as points of entry and rough indicators and should always be analysed coherently with the results of the qualitative base of information to provide a meaningful picture.

Second, aggregation of information is usually accompanied by a loss of information. The joint analysis of individual data in the conjoint analysis and the Likert-type scales are no exception. The loss of information is small, if the importance and performance structures of respondents are homogeneous; the loss of information is, however, large, if importance and performance structure vary considerably. To account for heterogeneity, both the importance and performance values should be analysed by clusters, such as country, region, company role, function of decision makers or goods type. Time could be an additional segregation factor in case of multiple data collection periods. However, due to the lower number of responses, a segregated analysis is not reasonable. This is a limitation to the explanatory power of the quantitative results. Thanks to the mixed methods design, the rich qualitative database is expected to compensate this shortcoming.

Third, the low number of responses raises the question about the reasons behind this fact. First, the questionnaire placed high demands on respondents. The demand in terms of dedication, time and knowledge do, however, not seem unreasonable with regard to the expectable capabilities of the respondents and compared to other online closed-response surveys. Second, the design of the questionnaire seemed to be new to a number of respondents. Obviously, conjoint analysis-based questionnaires are not yet as common as completely direct elicitation-based questionnaires. However, step-by-step textual, pictorial and video instructions guided the respondents through

the online questionnaire. Surprisingly, whilst some respondents had difficulties completing the online questionnaire, other respondents stated that they did not have any difficulties at all. Hence, there is substantial reason to believe that the questionnaire provided sufficient and adequate guidance and explanations. It is, of course, easier to ensure that respondents spend sufficient time and dedication on a survey in face-to-face settings than in online settings. In contrast to online survey settings, face-to-face survey settings provide the option to immediately clarify any open questions and eliminate uncertainty. By nature, online survey settings imply and require a higher proactivity of the respondent than face-to-face survey settings. Without exception, interviewees provided positive feedback on the face-to-face interviews. Some interviewees explicitly stated that they appreciate the use of personal interviews and criticised the sole reliance of much research on quantitative methods.

Fourth, as discussed earlier, prior to the interview phase it was decided to document interviews in written-only form in order to ensure that respondents do not soften their statements. Although by no means unreasonable against the background of the early words of warning by some experts, it turned out that a written-only form sets limitations to the interpretation and analysis. Despite a loss of information due to softened and omitted statements, an additional acoustic documentation proved to be superior. As soon as this became apparent, the documentation approach was adapted. Since this work mainly aims to reveal process knowledge, this limitation is of lower importance than in case of interpretive knowledge; yet, it is worthy to note.

Fifth, the online questionnaire was expected to show its strengths in allowing location-independent contribution to the base of information. Although a great deal was put into acquisition of respondents in a large geographic scope as well as journeys, the basis of information is subject to a bias in geography to a few major economic centres.

The view is held that the researcher reached the limitation of what is feasible under the prevailing circumstances and within the organisational framework of this research.

7   Diagnostics of Constraints of Supply Chain Performance

The previous chapters laid the foundation for what is to come now, in chapter seven – the diagnostics of binding constraints of further improvements in supply chain performance in Angola, Namibia and South Africa. First, based on the expert information and by means of reasoning, factors that represent binding constraints of further improvements of supply chain performance are identified. Factors in five dimensions are taken into account, namely, the economic, political, cultural, technical and organisational dimension.[243] Second, based thereon, based on the expert information, actions that are expected to lead to improvements as well as factors that are expected to provoke actions for improvement by other stakeholders are identified. Moreover, responsibilities and potential obstacles to the realisation of improvements are set out.[244]

7.1 Angola

Further improvements of supply chain performance in Angola are constrained by the following factors and should be eliminated by the actions as suggested thereinafter.

7.1.1   Binding Constraints

During colonial times, the transport system of Angola was designed to transport commodities for export. Road and rail infrastructure mainly crossed the country straight from sources in the hinterland to ports at the coast. Nonetheless, prior to the war, the performance of the transport system was fair and allowed the country to produce, transport and export agricultural goods. The war has, however, destroyed the infrastructure and led to a collapse of the port, road transport, rail transport and manufacturing system, in particular agricultural production, in Angola. In the meantime, alternative cross-border transport corridors have been established in southern Africa.

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243   These five dimensions are taken into account in order to ensure an as open as possible identification approach to constraints. More than one dimension may be at work in a single constraint. Attempting to classify constraints by dimension does not seem to be of value here and may, in addition, wrongly suggest a one-dimensional structure. For this reason, the constraints have been classified according to their subject.

244   The diagnostics attempts to provide a deliberate and coherent picture of the expert information and, thereby, generally attempts to reflect the experts' opinions. By nature, through data collection and processing actions, the researcher forms part of this research process. Yet, it was attempted to keep the researcher's impact to a minimum.

Since the end of the war, considerable improvements in port, road transport, rail transport, manufacturing locations as well as the entire supply chain system have been achieved.

However, since the decay of the oil price at the end of 2014, the lack of public and private funds is cutting off the financial means to continue recovering and developing the port, road transport, rail transport and manufacturing location system as well as the financial means to run a reasonable supply chain performance level. The lack of funds and foreign exchange has a crippling effect on the entire supply chain system.

(1) Because of the far-reaching crippling effects, as from end 2014, the lack of funds and foreign exchange represents the first binding constraint on improvements in supply chain performance in Angola.

The oil price and revenues from oil business and export are, however, largely externally determined. At least in the short term, the situation of the economy and of the supply chain system rests upon the situation of the oil market.

Notwithstanding, the oil-price related recession is only the tip of the iceberg. The low level of economic development as well as deficiencies in the structure of the economy and supply chain system constrain improvements in supply chain performance in Angola.

Despite significant improvements in port performance since the end of the war and statements that ports are the most developed and best performing part of supply chains in Angola, at some ports, the pre-berthing, cargo handling and import time is excessively high. Ports suffer from constraints in infrastructure, equipment and facilities, operations, administration and public services as well as hinterland transport. The insufficient port performance keeps the costs of port calls, duties and imports high.

First, contrary to their initial design and construction as export ports, for many years, since the war, ports have been used almost exclusively as import ports. Ports do not have sufficient berth, port basin and storage facility capacity. Insufficient equipment performance reduces port performance as well. At some ports, expansions and upgradings are underway. The lack of public funds has, however, stopped investments.

Second, a lack of staff capacity at customs and import agencies as well as limited operating hours of customs increases import time. The scarcity of capacity and limited operating hours along with still existing practices to circumvent formal by means of informal procedures inhibit a level playing field for port customers. The preceding country analysis has shown that between 1996 and 2016 the control of corruption did not change much in Angola.[245] It should, however, be noted that customs is regarded as one of the well performing public organisations and there are arguments that the level of corruption is – compared to other countries on the African continent – low.

Third, the splitting up of some ports into sectors that are run by different operators prevents a coherent organisation and optimisation of ports. Whilst some sectors provide a good performance, other sectors provide a low performance. Other non-split ports provide a good performance.

Fourth, despite positive experience with private sector participation in port operations at some terminals, there are also examples of, on the one hand, non-compliance with public trade regulation and, at the same time, a lack of public control as well as, on the other hand, examples of excessive public interference in port operations. Both issues harm port performance. Moreover, non-compliance with public trade regulation also works against a (re-)development of a local trade and production industry. The preceding country analysis has shown that the trading across borders regulation performance is much lower in Angola than in Namibia and South Africa.[246] The government effectiveness and regulatory quality improved between 1996 and 2016; yet, both indicators remain at a low level of performance compared to Namibia and South Africa as well as even more compared to the worldwide benchmark.[247] [248]

Fifth, the lack of capacity applies to the port hinterland transport as well. At some ports, the state of access roads is poor and the traffic and cargo volume exceeds the capacity of road infrastructure. Because of a lack of storage capacity at ports, cargo transfers to dry ports are necessary. Because of the poor road infrastructure and operational deficiencies in cargo transfers to dry ports, necessary cargo transfers add

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245   According to Control of Corruption of the Worldwide Governance Indicators

246   According to Trading Across Borders of Doing Business

247   According to Government Effectiveness and Regulatory Quality of the Worldwide Governance Indicators

248   Institutions of the Global Competitiveness Report point to low performance of institutions in Angola.

additional import time and costs. Rail transport is either not available or only provides a low performance. The lack of an adequate road and rail transport system impedes port hinterland transport and leads to congestion of immediate hinterland transport.

The preceding country analysis has shown that trade and transport infrastructure performance is – both compared to other factors of supply chains within Angola as well as to trade and transport infrastructure in Namibia and South Africa – low.[249]

Limited working hours of customs apply to both sea-land borders at ports as well as land-land borders to neighbouring countries. In addition, the need to re-write different customs documents increases the time and costs of imports even further.

The preceding country analysis has shown that customs performs lowest – both compared to other factors of supply chains within Angola as well as to customs in Namibia and South Africa.[250]

If the import time and, possibly due to the economic recession, maritime transport time continued to increase, the costs of imports would increase to such an extent that imports may become economically unfeasible. This would have considerable consequences, for instance to goods supply of the business of trading companies as well as a (re-)emergence of an agricultural and industrial production industry in Angola.

Because of the high reliance on imports as well as growing population and their increasing demands, the reduction in port volume and resulting reduction in congestion may only be a temporary phenomenon. Once the country leaves the recession, import volumes will reflect the actual demand for imports and will continue to increase. Improvements in import-oriented transport would allow for reductions in import time and import costs as well as transport costs. Time and cost reductions would improve supply of goods of companies and, thus, also improve the conditions for local production.

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(2) Because these deficiencies considerably impede goods supply and a (re-)emergence of a local production industry, import-oriented transport represents the second major constraint to supply chain performance in Angola.

Deficiencies in road and rail transport do not only apply to port hinterland transport, but to domestic transport between economic locations throughout the country as well.

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249   According to Infrastructure of Connecting to Compete
250   According to Customs of Connecting to Compete

Poor road infrastructure accelerates wear and tear of vehicles; a lack of bridges impedes smooth road transport. These deficiencies increase the costs of road transport and constrain road transport performance. Although the road infrastructure was reconstructed and is being maintained, there is still a need for more reconstruction as well as higher maintenance measures. Maintenance of road infrastructure does not keep up with the fast deterioration of infrastructure. A lack of rail infrastructure, low frequency of services as well as deficient allocation of public control lead to a low rail transport performance. Despite the reconstruction of railway infrastructure on specific lines, many railways are still in need of reconstruction. The poor road and rail transport performance explains the high importance – even for basic goods – of domestic airfreight in Angola.

Much agricultural land is located in remote areas. A fair domestic transport performance is a necessary condition for market-oriented production. Currently, the poor domestic transport system renders agricultural production in remote locations impossible. Improvements in domestic transport would allow for increases in transport conditions with regard to quality assurance as well as reductions in transport time and costs. This would improve supply and distribution of input goods of companies and, thus, improve the conditions for local production. It is expected that a redevelopment of rail transport in Angola will facilitate freight transport and foster agricultural production.

(3) Because these deficiencies considerably impede goods supply and an emergence of a local production industry, domestic transport represents the third major constraint to supply chain performance in Angola.

There is a potential to increase exports from Angola and benefit from local export business, in particular of agricultural products. However, improvements of import and domestic transport performance need to be achieved first, in order to provide the basic conditions of local production and export. At the moment, the lack of frequent transport services and lack of quality assurance during transport do not allow for agricultural production for distant markets. Domestic quality is too low and domestic costs are too high for locally produced products to become competitive in international markets. Once a sufficient import and domestic transport system and performance has been achieved, local production can be relaunched and exports become feasible. Because

of low export volumes, time to export is high compared to import time and an export routine at ports would still need to be established to become a meaningful exporter.

Although there is a potential to benefit from export business of neighbouring countries by providing an alternative export transport route, improvements of the domestic transport system are likely to bring larger direct benefits to supply chain performance and, in addition, cannot be missed on the way to providing export transport routes. It should, however, be taken into account that cross-border rail links could justify investments in rail transport infrastructure as well as higher frequency of rail services.

The high reliance on a single commodity and absence of a manufacturing industry make the country dependent on imports and exposes companies to a supply risk. The country needs to diversify the economic structure in order to sustainably recover and develop the supply chain system in Angola. The oil and gas industry itself does not provide much room for synergies in transport and production as well as diversification. This result goes in line with the findings of the preceding country analysis.[251]

The deficient supply of and high costs of electricity impede the existence and emergence of business operations, including agricultural production. This will become even more constraining as supply chains develop. Adequate supply of electricity is seen as a necessary condition for agricultural production and export of agricultural products.

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(4) Because of its importance to the functioning of supply chains including a re-emergence of agricultural production, deficiencies in supply of electricity represent the fourth major constraint to improvements in supply chain performance.

This result goes in line with the findings of the preliminary country analysis.[252]

A low quality of basic, higher and professional education and training along with a low qualification of the workforce impedes port, road and rail transport as well as manufacturing location performance. The low level of education and training as well as low supply of skilled workforce explains the high number of expatriates. Foreign workforce only provides a temporary solution to the skills shortage in Angola. The education and training of the workforce including knowledge transfer need to be improved in order

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251   According to the Atlas of Economic Complexity and the pertaining Product Space
252   According to Getting Electricity of Doing Business as well as Infrastructure of the Global Competitiveness Report

to recover and sustainably develop the ports, road transport system, rail transport system as well as allow for a revitalisation of the agricultural industry and an emergence of other production industries. Adequate basic and professional education would equip people with the necessary knowledge to take actions.

(5) Because of the low performance and high importance to improvements in supply chain performance, education and workforce represent the fifth major constraint.

This goes in line with the evidence from cross-country benchmarks.[253]

7.1.2 Actions for Improvement, Responsibilities and Obstacles

The country still needs to achieve an adequate import-oriented and domestic transport system, before the country can establish a market-oriented agricultural and industrial production industry and, thereby, diversify its economy.

Lack of funds and foreign exchange

In order to recover and develop the supply chain system and economy of Angola, the country needs to continue to invest in a number of factors. The lack of funds and foreign exchange has, however, stopped a redevelopment of the supply chain system and economy of Angola. Waiting for the economic situation to change can neither be taken for granted nor can it be regarded as a sustainable solution, and thus, does not represent an adequate option; so alternative actions are necessary. Since revenues from oil business are largely externally determined, indirect actions are necessary to alleviate this constraint. In order to reduce the high dependency from economic concentration on the oil business and provide the necessary funds, the country needs to diversify the structure of its economy. Because of the high potential, agricultural production but also industrial production should be intensified.

However, this requires that the basic conditions for local production are in place – which currently is often not the case. It still lacks the basic conditions for local agricultural and industrial production. It is the lack of an adequate import and domestic transport performance that constrains a re-emergence of the agricultural and emergence of a manufacturing industry in Angola. Thus, an adequate import and domestic

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253   According to Higher Education and Training of the Global Competitiveness Report

transport performance needs to be achieved first, before the local production and economic diversification can start. Local content regulation may only be of value if the necessary production and services are locally produced and available. Likewise, a public request to companies to rely almost exclusively on local workforce does not seem to be economically feasible, if the local workforce does not possess the necessary know-how. Hence, it appears to be difficult to strengthen local production directly.

Because a high number of land mines are still spread on fertile land, land mines still need to be removed before any agricultural production can be resumed.

Import-oriented transport

The capacity of ports in Angola should be increased, that is, the depth of port basins, the number of berths and the storage capacity need to be increased. Some terminals and ports are in need of knowledge transfers in order to improve their performance.

Ports should be managed as a single area of control and by a single port authority in order to allow for a coherent organisation and optimisation. Port authorities should ensure that port operators comply with public trade regulations and, at the same time, restrain from undue public interference. [254] Berth windows should be implemented at all ports in Angola in order to improve vessel and cargo handling operations. Whilst there are arguments for a public provision of port infrastructure and operations, there are also arguments for a public provision of infrastructure and a private provision of port operations. Below the line, irrespective of the port management and operational model, what seems to be important is that port operations are conducive to trade as well as to the economy. Good examples of well-organised and well-performing ports can be found in many countries around the world, for instance at the port of Hamburg.

The quality and capacity of port access roads and immediate hinterland transport infrastructure needs to be increased. Because of organisational deficiencies in cargo transfer from seaports to dry ports, there is a need of improvement in coordination

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254   To recall, the World Bank (2013: 2) states that countries that score best in doing business are neither those without any public regulation nor those with excessive public regulation; rather countries that score best are those that provide a regulatory system, which protects consumers and the public as well as allows the private sector to strive.

and information exchange with port customers as well as in location identification of logistics units and cargo.[255]

Domestic transport

The road network needs to be extended to allow for countrywide domestic transport. Road infrastructure needs to be enhanced in order to allow for weather-independent road transport. Bridges need to replace ferries in order to allow for more reliable transport operations. Improvements in road transport performance are the responsibility of the public sector and private sector. Whilst the arrangement of infrastructure maintenance measures is a public sector responsibility, the execution of maintenance measures is a private sector responsibility. Investments in road infrastructure without an improvement in legislation and law enforcement of load regulation and safety – including infrastructure and vehicles – are unlikely to lead to a sustainable improvement of road infrastructure and road transport performance. The provision and assurance of compliance of regulation on load limitations and safety is the responsibility of the public sector. Other countries in southern Africa, such as Namibia, have had transport regulation in place for long time.

The envisioned implementation of a new customs IT system is expected to set a document standard across countries. A harmonisation of customs documents as well as improvements in operating hours of customs offices at border posts is the responsibility of the government.

Because of the inability to predict public income from the oil business, the public sector needs to find alternative measures to fund public infrastructure, such as road infrastructure. Toll charges and licensing of road infrastructure would provide a solution.

Railways are still in need of reconstruction. The high number of land mines that are still spread on strategically important transport routes impede the reconstruction of rail transport infrastructure. The relaunch of rail transport is not just a matter of reconstructing the infrastructure, well-working transport operations have to be established as well. On railways that have already been reconstructed, smooth railway operations still have to be established – that will take at least five years. Transport frequency needs to be increased. Transhipment centres are still necessary to allow for freight

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255 Even though dry ports, or put differently inland terminals, are a promising means to alleviate local constraints at port locations (cf. Notteboom & Rodrigue 2005: 5-6), dry ports are – of course – only able to improve the performance if the transfer works well.

transhipment and transport as well as agricultural production in remote areas. Rail transport will only be accepted for transport and incentivise agricultural production if the rail transport performance meets the transport requirements of goods, such as frequent transport services, transhipment centres as well as refrigerated waggons.

In order to establish accountability and transparency in the rail transport business, instead of a separation of responsibilities between different ministries, the rail transport system should be under control of a single organisation and single ministry.

Because of the public ownership and operation of the rail transport system, the government should create incentives for the private sector to make use of rail transport.

A privatisation of the rail transport system may be the best option to sustainably improve rail transport performance. Licences could allow companies to collect track access charges and oblige them to maintain the infrastructure. However, because of the capital intensity and long amortisation periods, comprehensive private sector participation in rail transport may be unlikely. In addition, a privatisation may lead to insufficient re-investment in the rail transport system and make public sector ownership and operation the only feasible approach to sustainable improvements in rail transport performance. However, the lack of funds constrains public investments in the rail transport system. A private-public partnership would be an option to improve rail transport performance. The operation of transhipment centres allows room for private sector participation.

Improvements in cross-border transport would need to go along with improvements in the security situation in the east of the country to ensure secure transport operations.

An example of a well performing transport and transhipment system that Angola should look at and learn from exists in South Africa. The high performance of the distribution system allows South Africa to distribute goods at low costs and thereby contributes to the high performance of the manufacturing industry in South Africa.

Electricity supply

There is a need to improve the electrical infrastructure and reduce the costs of electricity.

Because of the lack of funds and foreign exchange, alternative measures to take actions for improvement are necessary. Awarding licences would allow private companies to financially participate in electricity supply and oblige them to operate dams and hydroelectric power.

Because the general infrastructure is well developed in South Africa, that is a good example for Angola to look at and learn from.

Education and workforce

People need to be equipped with the necessary trading, transport and production knowledge in order to operate ports, road and rail transport systems as well as to produce products. A vocational education consisting of learning at school and training at companies should be established. Improvements of the educational system are the responsibility of the government. Currently, the government makes use of obligations to use the local workforce and penalites if a foreign workforce is used. Instead, the government should create incentives for companies to educate and train their employees and to ensure that knowledge is actually transferred to the local population. The public sector should support private sector education and training efforts. By contrast, in Kenya, the government supports education and training efforts of companies.

Improvements in education and qualification have to go in line with improvements in the attitude and behaviour of the workforce. Although, after the prolonged war, rationals for a high persuit of personal interests and application of former informal procedures may exist, a shift towards a higher pursuit of socially reputable attitude of the workforce is needed to sustainably recover and develop the supply chain system of Angola. The preceding country analysis has shown that income inequality is high in Angola.[256] Improvements in satisfaction of basic and security needs[257] and increases in income equality may represent a necessary condition in order to sustainably improve attitude and behaviour of the workforce and eventually improve supply chain performance. The risk that private interests may interfere with public interests and objectives, like in ports, railway systems, agriculture, forestry and fishery may represent an obstacle to improvements in supply chain performance. A higher transparency in public organisations is necessary to improve supply chain performance sustainably.

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256   Cf. Gini index
257   Cf. Maslow's hierarchy of needs

Foreign direct investment along with knowledge transfer in non-oil sectors would provide a means to create the still lacking skills of the local population. To bring countries to invest in Angola, the business environment needs to be conducive to doing business in Angola. This, however, requires that the public regulation is conducive to direct investment, such as dealing with contracts and taxes.[258] The public sector needs to provide a regulatory environment that is conducive to business.

The establishment of manufacturing sites is the responsibility of the private sector.

7.2　Namibia

Further improvements of supply chain performance in Namibia are constrained by the following factors and should be eliminated by the actions as suggested thereinafter.

7.2.1　Binding Constraints

During colonial times, Namibia was highly dependent on other economies and it is only since its independence in 1990 and 1994, respectively, that the country is able to establish a self-serving economic foundation. Still today, due to the lack of a self-sufficient economy, the country heavily relies on other countries. The country is late in developing its own, self-serving economic and supply chain system. Nonetheless, prior to independence, the transport system of the country was well developed.

The domestic market is small in Namibia. Other countries can make use of much larger domestic markets that provide the justification for own and well performing supply chain systems. Nonetheless, the country is geographically well located to serve as a transit country to neighbouring countries. Cargo volumes and port calls are, however still low compared to ports in South Africa. Distances to transit markets are high.

(1) Because of its high importance to supply chain performance, the small market size represents the first major constraint to improvements in supply chain performance.

258　According to Paying Taxes of Doing Business, dealing with taxes does not seem to represent a constraint; according to Enforcing Contracts of Doing Business, dealing with contracts seems to represent a constraint.

This result goes in line with the findings of the preceding country analysis.[259] [260]

To extend its market size, the country is developing its role as a transit country. However, since the decline of revenues from the oil business in Angola and drop in demand, the port of Walvis Bay and its hinterland transport corridors are experiencing substantially lower transit volumes. The role as a transit country makes Namibia dependent on the economic situation in neighbouring countries and distant trading partners.

Currently, the country's main port, the port of Walvis Bay, is subject to a massive infrastructure and equipment expansion and upgrading programme. Once the expansion and upgrading is complete, the port infrastructure and equipment will not represent a constraint. The port development is expected to attract more shipping lines. Provided that the infrastructure and equipment is run by an adequately educated and trained as well as sufficiently large workforce, the port will not represent a constraint.

Inefficiency of customs processes, a lack of qualification of customs staff, a lack of capacity at customs, insufficient operating hours for clearance and releases as well as an insufficient degree of digitisation of customs processes lead to high import customs processing time. Although the customs authority realised that there was a shortage in capacity to handle imports and started to take actions, there is still a need to submit paper documents. The customs system is not as developed as in South Africa. It should, however, be mentioned that a higher import time is also attributed to a carelessness and lack of experience of exporters and importers in neighbouring countries.

Despite complaints and weaknesses, in terms of port charges and tariff setting, port connectivity, vessel and cargo handling, and customs processes, the port performance does not represent a major constraint to supply chain performance in Namibia.

At the interface between the port and the rail transport system, a lack of handling equipment, rolling stock as well as a lack of coordination impede hinterland transport.

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259   According to Market Size of the Global Competitiveness Report

260   The authors of the Economic Development in Africa Report 2011 state that due to the small sizes of their economies, access to larger markets would allow these countries to expand their production and export volumes, achieve higher economies of scale and provide the foreign exchange for input and capital goods imports (UNIDO & UNCTAD 2011: 30).

A lack of lorry parks leads to congestion of access roads around the port. The capacity of distribution centres, especially for cold storage, is not in line with the expected increase in freight volume. A scarcity of space impedes the allocation of land to distribution centres and lorry parks and drives prices of land high. There are arguments that the government does not allocate enough land. Once volumes through Walvis Bay increase, the lack of distribution capacity is likely to become a major constraint.

Despite good road transport infrastructure, the existing infrastructure is not able to absorb the increase in freight volume sustainably. The high load on road infrastructure already requires high maintenance measures. The road infrastructure is deteriorating.

The state of rail infrastructure and equipment is poor; it is outdated; thus, the speed is low; speed limits are necessary in order to prevent derailments. The harsh environment strains the rail infrastructure, for instance between the port of Lüderitz and Keetmanshoop, and impedes or even prevents rail transport. In addition, because of the characteristics of rail transport, such as indirect, longer transport distances as well as the need for higher critical volumes compared to road transport, on distances up to 600 kilometres, rail transport is not able to keep up with road transport performance. Because of the poor rail transport performance, apart from bulk freight, for many goods road transport remains the only acceptable modal option for hinterland transport.

The characteristics of road transport allow road transport to provide a high performance. The low rail transport performance also contributes to the high importance of road transport in Namibia. Road transport is likely to absorb further increases in freight volumes, albeit at high total costs. Road transport is not supported by rail transport. High investments in maintenance and new investments are necessary to allow for improvements in rail transport performance. Up to now, the road infrastructure does not represent a constraint to transport performance. However, if freight volumes continue to increase and road transport remains the only accepted transport option, even for a high share of rail-friendly freight, the road infrastructure may deteriorate and increase the costs of road transport. Then, the road infrastructure is likely to become a major constraint to transport and supply chain performance in Namibia. The share of rail-friendly freight, in particular of bulk freight, by rail transport needs to increase.

The adequate alignment of ports and the hinterland transport system becomes even more important when considering the objective to develop the country into a logistics hub for southern Africa. To become a logistics hub, the country needs to compensate

disadvantages resulting from a small domestic market und high distances to transit markets by advantages in effectiveness and efficiency of supply chain performance. The success of the logistics hub is regarded as hinging on the rail transport system.

There are no rail cross-border links to neighbouring countries. The railways in the north and east stop at Oshakati, Grootfontein and Gobabis, respectively. There is a railway neither from Oshakati, nor from Santa Clara or Gobabis to the border.

Deficiencies in qualification of the management and staff of the rail transport company also impede rail transport performance. In addition to deficiencies in qualification, there is a scarcity of a sufficiently qualified workforce. The lack of a well-defined and consistent strategy for the rail transport system and, thus, unclear way forward, seems to contribute to the insufficient progress in rail transport performance as well. The rail transport performance may also be caught between the need of the public sector to ensure employment and a sound competitive positioning of the rail transport system.

A further deterioration of the rail transport performance would pose a challenge to business operations.

(2) Because of these deficiencies and high importance of rail transport as an alternative and complementary mode of transport, at least for domestic transport, in Namibia, deficiencies in the rail transport system and performance represent the second major constraint to improvements in supply chain performance in Namibia.

This goes in line with the findings of the evidence from cross-country benchmarks.[261]

Despite considerable deficiencies in the rail transport system and its consequences, the poor rail transport performance is not the only factor that puts the sustainability of the road infrastructure at risk. Non-compliance with load regulations leads to faster deterioration of the road infrastructure as well. The circumvention of load regulations as well as avoidance of mass distance charges puts compliant transport companies at a disadvantage. Although non-compliance of load regulations does not seem to represent a major constraint, a higher compliance would contribute to the sustainability of the road infrastructure as well as maintain a level playing field among transport operators. The insufficient degree of traffic regulation and prevention of accidents

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261   According to Infrastructure of Connecting to Compete

leads to a high number of accidents. The high accident rate impedes road transport performance.

Transport corridors to neighbouring countries show differences in performance. Apart from the corridor to South Africa, the other corridors to Angola, Zambia and DR Congo as well as Botswana are still developing. At border posts of neighbouring countries, difficulties with entry requirements, corruption, electricity supply as well as availabily of lorry parks impede cross-border transport. Differences in maximum vehicle weight limitations between neighbouring countries impede cross-border transport. In addition, like at ports, an insufficient degree of digitisation of customs processes impedes cross-border transport. Nevertheless, deficiencies in border processes do not seem to represent a major constraint.

Many people did not receive basic education. Often, people's state of knowledge does not conform to the state of knowledge, common and necessary, to run today's supply chains. Deficiencies in basic and professional education affect both the private sector and public sector. Insufficient qualification keeps organisations from running advanced supply chain operations. The availability of sufficiently educated people in customs and cross-border operations is not ensured in all regions of the country and causes cumbersome processes. Deficiencies in transport regulation are also attributed to a lack of expertise at the legislator. As part of the political and economic transition, staff at public authorities was replaced without consideration of their qualifications and need for a smooth handover. However, these people should have been part of the transformation in order to maintain public sector performance. There are arguments that public authorities are still run by people who are insufficiently educated in order to sustainably develop the supply chain system of Namibia. This leads to inadequate decisions on public policies, such as regulation of transport operations.

The qualification of the workforce at public authorities needs to improve in order to attract higher freight volumes and contribute to improvements in supply chain performance.

It is only for some years that logistics professionals are educated and trained in Namibia. There is a high demand for well-educated and experienced logistics professionals. The scarcity of experts and specialists constrain port, road transport, rail transport, manufacturing location as well as their supporting public authority performance. The country needs to establish the necessary knowledge base in order to become a logistics hub.

(3) Because of the importance of experts and specialists to the sustainable development of supply chains, both in the private and public sector, education and workforce represents the third major constraint to improvements in Namibia.

This goes in line with the evidence from cross-country benchmarks.[262]

Water is a scarce resource at the county's main economic centre. There is a backlog in the state of water supply infrastructure.The current drought negatively affects the agriculture as well as construction industry. The country is a semi-desert, the scarcity of water is not new to the country, but now there is an urgent need to set up a plan to alleviate the scarcity of water. Further deteriorations in water supply pose a risk to business operations. The scarcity of water speaks against water-intensive businesses. Deficiencies in general public infrastructure, such as water supply, require that manufacturing companies set up their own backup strategies and infrastructure.

(4) Because of the importance to supply chain operations, water supply represents the fourth major constraint to improvements in supply chain performance.

There is a backlog in the state of electricity supply infrastructure. Fluctuations in supply of electricity require organisations to maintain their own sources of supply and backup infrastructure. Electricity supply in Namibia highly depends on supply from South Africa; in the past, South Africa faced issues in electrical infrastructure and supply as well. Deficiencies in electricity supply also impede border post operations.

(5) Because of the importance to supply chain operations, electricity supply represents the fifth major constraint to improvements in supply chain performance.

Direct investments require a long-term foreseeable investment policy development. To attract investments, the country needs to establish and maintain a conducive environment, including hard and soft infrastructure. Currently, discussed amendments to the affirmative action programme, the New Equitable Economic Empowerment

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262   According to Higher Education and Training as well as the most problematic factors in Namibia of the Global Competitiveness Report

Framework[263], cause concerns about the ease of doing business in Namibia. Although the programme is politically justifiable, it puts foreign investors off and may harm the economy.

(6) Because of its importance to a sustainable development of supply chains, the uncertain investment policy represents the sixth major constraint to improvements in supply chain performance.

7.2.2 Actions for Improvement, Responsibilities and Obstacles

The country needs to maintain and strengthen its domestic and cross-border transit transport system and attract production companies in order to attract higher volumes.

Small market size

To increase its domestic market size and reduce its dependency on other countries, Namibia is trying to increase transport and transhipment as well as local production volume. Good access to input goods and services is a necessary condition to establish a production industry. Currently, the local market and base of production is low.

Against this background, it seems reasonable to pursue a strategy that first aims at attracting higher transport, transhipment and transit volumes and, second, at attracting production companies. One of the measures to attract higher transport, transhipment and transit volumes are actions for improvement in port performance. In order to compensate higher costs of the port of Walvis Bay compared to ports in South Africa, the port company should examine whether improvements in productivity would reduce costs and port charges. Because the port is a public enterprise, the port company and government are responsible for taking actions for improvement. Port users are responsible for putting pressure on the public port company and government in order to provoke actions for improvement. There are, however, arguments that a privatisation of selected parts of the logistics chain could exert pressure on the port, thereby, lead to improvements in port performance, and eventually provide value to the country.

There is a need to increase office hours of the release desk. In order to increase the office hours, there is a need for more staff. In the future, higher handling volumes are

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263   Cf. Government of the Republic of Namibia 2015

expected to justify higher office hours. There is a need for a higher digitisation of customs processes. Due to the lower volumes, in terms of adopting new technologies Namibia will always be a bit behind South Africa. Nonetheless, Namibia should look at, learn from and follow the example of South Africa. The customs authority should understand its role as a service provider. It must be ensured that the customs system facilitates trade. The responsibility to take actions for improvement in customs processes lies with the customs authority.

To increase transport volumes through Namibia, there is a need to intensify cooperation with neighbouring countries.

In order to allow the port of Walvis Bay to handle larger cargo volumes and to attract higher volumes, the hinterland transport system needs to be aligned as well.

The marshalling of cargo and waggons needs to be better synchronised. There is a need for a higher coordination between the port and the rail transport company as well as more handling equipment in order to ensure a smooth transhipment from the port to rail transport. Improvements at the interface to rail transport and in rail hinterland transport are the responsibility of the rail transport company.

In order to establish a logistics hub in Walvis Bay, a sufficient number of distribution centres, especially for cold storage, need to be provided in Walvis Bay. Anchor clients should be attracted in order to provide the necessary volumes and strengthen the Walvis Bay Corridor. However, due to the scarcity of land around the port, not enough land is allocated to lorry parks and distribution centres.

To avoid road infrastructure becoming a major constraint, upgradings of road infrastructure and increases of maintenance or improvements in rail transport are necessary. On certain road sections, the number of lanes as well as their width should be increased. To ensure adequate investments in road infrastructure, investments should be made according to depletion and revenues from user charges. A strategy to improve the road transport network exists and actions take place. The government is significantly investing in maintenance and new investment in road infrastructure. The responsibility to improve the road infrastructure lies with the road authority and ministry of transport. However, investments in road infrastructure may be impeded by scarcity of funds as well as a rivalry for funds between social and economic objectives.

To limit the need for upgradings and maintenance, investments in road infrastructure should be accompained by improvements in transport regulation, such as compliance

with load limitations. To reduce road accidents, there is a need for regulation of driving and rest periods. Because there is a fear that mandatory regulations on driving and rest periods place an excessive burden on transport companies, private transport operators prefer voluntary regulations. The responsibility to implement regulations on driving and rest periods lies with the transport inspectorate and ministry of transport.

There is a need for improvements not just at the port but through to the borders of neighbouring countries. Gross vehicle weight limitations should be harmonised across countries in southern Africa. Single windows and one-stop border posts are currently implemented and should be implemented, respectively. Because the customs authority is a public agency under the ministry of finance, the responsibility for improvements in customs services lies with the public sector. The government needs to ensure that the customs system facilitates trade. An example of facilitated customs processes from the port to neighbouring countries can be found at the port of Daressalam in Tanzania.

Rail transport system

The rail tansport system and performance need to be improved. There is a need for a rail transport system that supports the road transport system. This, however, requires that a number of weaknesses, in the areas of infrastructure, equipment, qualification, operations including coordination among stakeholders as well as strategy are sorted out. The signalling as well as automation of points and crossings needs to improve. The tracking of locomotives and waggons needs to improve in order to increase visibility. Currently, the rail transport company is significantly investing in rail transport infrastructure and equipment. Railways are upgraded to an axle load of 18.5 tonnes and a speed of 100 kilometres per hour and orders for new locomotives were placed. The rail transport company visited shippers and countries with advanced rail transport systems. The rail transport company is currently redefining the role of rail transport in the supply chain. These actions are expected to increase domestic rail transport performance and bring potential customers of rail-friendly freight to decide on rail transport in the future. This, in turn, is expected to reduce the load on road infrastructure. The qualification of the staff of the rail transport company needs to improve. There is a need for specific rail transport training, with regard to management, engineering and operations. A well-defined strategy to the rail transport system in Namibia, as well as a well-defined strategy of the rail transport company with an alignment towards market demand for rail-friendly freight, could lead to long-term benefits

to the rail transport company and transport system of Namibia. There are, however, arguments, that the critical factors of success, such as international integration and competition, like in the port sector, do not exist in rail transport in Namibia and still contribute to insufficient performance. Previous attempts to improve the rail transport system failed. A lack of funds impedes a redevelopment of the rail transport system.

Provided that the rail transport system remains under public ownership and operation, improvements in the rail transport system are the responsibility of the public rail transport company, the ministry of transport as well as the government. There are also arguments for private sector participation in rail transport in Namibia. It is, however, questioned whether sufficient business volume exists to run the rail transport system profitably. Because of the expected lack of profitability, the private sector is not interested. The government is in favour of private participation in rail transport. The Walvis Bay Corridor Group attempts to attract companies that would benefit from rail transport and, for this reason, would be willing to invest in rail transport. Attracting private investors for rail transport, however, remains a challenge. The private sector argues that investment in rail transport is the responsibility of the public sector.

To reach an agreement in cross-border transport between Namibia, Zambia and DR Congo as well as Namibia and Botswana, organisations consisting of public and private stakeholders have been set up.

Because of the high export and import volumes, there is a potential for cross-border rail transport to neighbouring countries, such as Zambia and DR Congo. A railway between Namibia and Angola would improve cross-country transport. Along with dry ports for neighbouring countries, railway lines on the Walvis Bay-Ndola-Lubumbashi as well as on the Trans-Kalahari Corridor would allow the country to use its expanded port to full capacity. Against the background of existing alternative transport modes, alternative transport routes and competition, unilateral, biased interests in the availability of these railway lines as well as high financial requirements, there are considerable concerns about the profitability of these cross-border railway lines to transit markets. Because of the high costs of construction, there is a need for external funding.

The public sector prefers a public-private funding approach to cross-border transport. It remains questionable whether the necessary private funds can be raised unless substantial concessions in mining rights by neighbouring countries are made to ensure the necessary utilisation. Moreover, alternative transport corridors already exist and additional transport corridors are expected to emerge and be established in the

future. Add to that the markedly different views on the primary mode of cross-border transport among transport associations in Namibia. Private participation could serve as a means to ensure that rail transport is exposed to competition and urged to improve.

Because the scarcity of funds represents a constraint to improvements in rail transport, there are arguments for an investment strategy that concentrates on investments in domestic rail transport first. Such an approach would by no means thwart a cross-border rail transport strategy, but rather reduce the intial barriers, time as well as risk and costs of improvements in cross-border transport. Instead of cross-border railways to Zambia and Botswana, the railway to Gobabis should be upgraded and dry ports should be built at Gobabis and Grootfontein in order to provide an intermodal interface between rail and road transport. Improvements in domestic rail transport would also lead to improvements in cross-border rail transport. Once the logistics hub has been established and there is a commitment of companies and countries to make use of the corridor in the future, can an extension of the railway be realised.

Education and workforce

To ensure that the necessary workforce to develop the supply chain system in Namibia is available, first, higher investments in education and qualification as well as, second, easier access of experienced and knowledgeable expatriates and knowledge transfer are necessary. Because the short to medium demand for skilled workforce to put the logistics hub concept into practice cannot be provided by Namibia alone, there is a need for qualified expatriates. This, however, requires that the government changes its attitude towards expatriates.

The education and training of the workforce of the public rail transport company need to increase. There is a need for specific rail transport training, for instance for engineers and train drivers. It takes too long to educate train drivers.

The education and training of customs staff needs to improve. Sufficiently qualified staff needs to be ensured at all border posts in all regions in Namibia.

A new, educated workforce with new ideas should be employed at public authorities. Public authorities should enter into partnerships with local universities in order to provide authorities with new ideas as well as to allow students to gain professional experience. The attitude of public authorities towards performance needs to be improved. The government as well as ministry of education are responsible for improving public

authority performance. Both public authorities as well as universities are responsible for increasing collaboration.

Despite a need to ensure labour market participation of all parts of the population at employable age, employment according to qualification still needs to be ensured.

There is a need for higher public investments in education and training. Kenya significantly invests in the education of its population – that is a good example for Namibia to look at and learn from. Because younger Namibian's will be better educated and informed, they will find ways to sustainably strengthen the supply chain system and economy of Namibia.

Water supply

The water supply infrastructure needs to be improved. The government is responsible for ensuring water supply. The city of Windhoek and the national water company set up a plan to limit water consumption. This should, however, have been done much earlier. A short-term plan exists; there is a need for a medium to long-term plan, i.e. a strategy to deal with the scarcity of water. In contrast to the road and rail transport system, in water supply, there is a lack of strategies and actions for improvement.

Electricity supply

The electrical supply infrastructure of the country needs to be improved, including electrical infrastructure at border posts.

Investment policy

The government should reconsider the development of the affirmative action programme. The elimination of deficiencies of the affirmative action programme is the responsibility of the public sector. Once the government has provided the necessary regulation, private sector actions could be examined.

7.3 South Africa

Further improvements of supply chain performance in South Africa are constrained by the following factors and should be eliminated by the actions as suggested thereinafter.

7.3.1 Binding Constraints

For decades, most cargo to southern Africa has been imported through ports in South Africa and carried to the hinterland countries in the SADC. Supply chains of South Africa had the chance to attract high freight volumes, achieve high economies of scale as well as establish a large and well-performing logistics and manufacturing industry and supporting environment. The high performance of transport corridors compensated for higher transport distances. The country has achieved a competitive advantage and superior role as a gateway and manufacturing location in southern Africa as well as on the African continent. However, against the background of emerging port and transport corridor alternatives in southern Africa, ports, transport corridors and manufacturing locations in South Africa may face higher competition in the future. There is a risk that higher competition along with deficiencies in supply chain performance reduce freight volumes as well as increase the costs of supply chains in South Africa. High freight volumes and high economies of scale are, however, necessary to allow for low supply chain costs as well as a high supply chain performance. To keep its relative competitive position, a number of constraints need to be eliminated.

In contrast to geographically similar countries, historically, some major economic centres in South Africa are located at the interior of the country, without any direct river or sea access. Many manufacturing locations in South Africa are far away from main markets. The high transport distances between ports and economic centres in the hinterland cause high transport costs and increase the costs of production in South Africa. The high distances put manufacturing locations and companies at a disadvantage in international competition. However, apart from rail transport, a high transport performance compensates weaknesses in economic and transport geography. Companies will set up locations, if the supporting factors to run locations are available. Currently, despite weaknesses, the manufacturing locations do, however, not seem to represent a major constraint to supply chain performance in South Africa.

Although port performance is still high compared to ports on the African continent, port performance in South Africa has deteriorated. A lack of capacity as well as insufficient efficiency levels of port operations cause considerable delays at some ports in South Africa. At the same time, port charges are high. Frequent labour strikes interrupt port operations. During labour strikes, vessels are rerouted to alternative ports. The design of the affirmative action programme leads to inadequate staffing. High labour costs increase port costs. Some shipping lines have already moved to alternative

transhipment hubs. Ongoing measures as well as port development projects are expected to eliminate capacity constraints. There is a risk that insufficient port performance increases transport costs to such an extent that transhipment and transport volumes decrease. However, these deficiencies are likely to become more pronounced as alternative gateways and transport corridors emerge and are established. Whilst capacity constraints are being addressed, operational efficiency as well as education and workforce-related deficiencies seem to prevail in the near future. These issues do not only apply to ports but to the other domains of supply chains in South Africa as well. Despite weaknesses, port infrastructure and suprastructure do not – apart from the port of Durban as the country's and region's major gateway and transhipment hub – seem to represent a major constraint to supply chain performance in South Africa.

In the past, freight transport volumes in South Africa increased. However, the additional freight volumes have mainly been absorbed by road transport. Even rail-friendly freight has been absorbed by road transport. The high freight on roads increases the load of road infrastructure and accelerates the deterioration of road infrastructure. The state of primary roads is still good. Secondary and tertiary roads are deteriorating. The costs of road maintenance are much higher than the revenues from road usage charges. The scarcity of public funds impedes the adequate maintenance of road infrastructure. There are arguments that the municipalities do not have the staff capacity to maintain the existing infrastructure, to invest in new infrastructure as well as to enforce the law. Because the state of the primary road infrastructure is good and road transport performance is high, currently, neither primary road infrastructure nor road transport performance constrain supply chain performance. However, the road infrastructure, especially of secondary roads, needs to be maintained adequately. If freight volumes continue to increase and maintenance measures do not keep pace, the state of the road infrastructure may constrain supply chain performance in South Africa.

Deficiencies in the state of road infrastructure do not only stem from higher freight volumes on roads, but also from deficiencies in law enforcement, such as vehicle condition, load regulation and driver licences and behaviour. It is not a lack of legislation, the necessary legislation exists. The control of compliance with the law is insufficient. The fierce competition in the road transport industry encourages non-compliant behaviour of road transport operators. Non-compliant behaviour prevents a level playing field in the transport market as well as a sustainable development of the supply chain system. Deficiencies in collecting toll charges narrow funds for investments.

Instead of putting more freight on roads, rail-friendly freight should be carried on rails. This, however, requires that rail transport performance meets the customer expectations. During the 1980s, rail transport was the primary mode of transport in South Africa and there seemed to be no need to align its transport performance to the market needs. In addition, the deregulation of road transport in South Africa increased road transport performance. Rail transport was not subject to any considerable competition. Since then, the investment in infrastructure and rolling stock was insufficient. Deficiencies in rail infrastructure and rolling stock impede rail transport performance. There is a lack of rail terminals and capacity at rail terminals. The harsh environment in certain regions keeps the infrastructure from functioning well. Speed limits are necessary in order to prevent derailments. There is a lack of visibility of freight and rolling stock during rail transport. Freight, even rail-friendly freight, moved from rail to road transport. In place of rail transport, road transport became the primary mode of transport. Today, rail transport performance of general freight is insufficient. The low rail transport performance keeps potential customers from making use of it. For instance, the automobile industry is struggling with rail transport performance. Rail transport performance deteriorated. By contrast, heavy bulk, long distance rail transport performance on specific lines is very high in South Africa. Road transport saved supply chains in South Africa from a collapse. Instead of rail freight tariffs, insufficient service, i.e. frequent delays, lack of frequent services, lack of reliability – both of the rail transport company as well as its customers, impede rail transport performance in South Africa. Because the total costs of the logistics of rail transport are higher than of road transport, road transport is the preferred mode even at distances of 600 kilometres. Cross-border rail transport performance is insufficient.

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(1) Because of the high impact of the rail transport performance on the road transport infrastructure and hinterland transport performance, deficiencies in rail transport represent a first major constraint to supply chain performance in South Africa.

Trade legislation is not conducive to trade. Despite improvements in cross-border transport over the last years, such as electronic submissions of customs documents, border posts still suffer from a number of constraints. The need to pass through two border posts and inspections, inefficiency of border post operations as well as corruption at border crossings still cause considerable delays in cross-border transport. Delays at border-crossings to neighbouring countries increase the costs of cross-border

transport and trade as well as costs of landlocked countries. Delays and costs reduce the performance of cross-border transport and supply chains. Corruption at border crossings increase the costs of goods and services and place a burden on business.

(2) Because of their high importance on transport and trade in South Africa, deficiencies in border crossings represent a second major constraint to improvements in supply chain performance.

This result goes in line with the findings of the preceding country analysis.[264]

During the 1990s, as part of the political and economic transition, many skilled people left the rail transport and public sector. Insufficiently qualified people were put into positions at the management level of the rail transport company. The loss of knowledge led to a negligence of maintenance and development of the rail transport system and to a collapse of the functioning of public organisations and, thus, public services.

The basic and professional education of the wider population is insufficient. Many people never attended school or university. The inability to pay tuition fees keeps many people from making use of education offerings. A vocational education and training does not exist. Often companies and business associations provide the necessary basic and professional education. There is progress in education, especially in the group of previously disadvantaged people. However, still too many graduates do not meet the requirements of the labour market. It will take many years to make up this skill shortage. There is a shortage of skilled and adequately priced labour to run daily operations.

Despite a large labour pool, labour costs are high compared to other developing countries. The need of many people to financially support relatives is a major reason for the high labour costs. As indicated earlier, income inequality is high in South Africa. The demand for preferential employment as well as scarcity of well-educated previously disadvantaged people creates incentives to change jobs frequently. This leads to excessive labour cost increases and is at the detriment of supply chain performance. Labour cost increases are higher than increases in labour productivity. High

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264   According to Customs of Connecting to Compete and Trading Across Borders of Doing Business

labour costs increase the costs of the transport and manufacturing system and, thus, decrease the competitiveness of products and services from South Africa. The country finds itself in fierce competition in the manufacturing sector with other countries.

(3) Because of the deficiencies and the high importance of improvements of education and workforce to supply chain performance, deficiencies in education and workforce represent the third major constraint.

This goes in line with the evidence from cross-country benchmarks.[265]

In addition to deficiencies in adequately skilled and priced workforce, high protection of employees and high power of labour unions prevent necessary balancing mechanisms between supply of and demand for labour. The employee-friendly labour laws provide room for long-lasting strikes. The frequency and duration of labour strikes is much higher than in other countries. Frequent labour strikes and high labour costs create uncertainty for companies, which run or are considering setting up a location. This hinders long-term private sector investment decisions in favour of South Africa.

The affirmative action programme leads to inadequate staffing decisions in the public and private sector. People get into positions that exceed their qualifications.

This negatively affects the performance of the public and private sector. The scarcity of well-educated previously disadvantaged people along with the design of the affirmative action programme drives labour costs high. Whilst large companies have alternatives on hand to alleviate effects from affirmative action measures, small and medium sized companies cannot make use of alternative measures and have to accept negative effects on their business performance.

(4) Because of the potential short, medium and long-term effects on the location competitiveness, deficiencies in labour market policies represent the fourth major constraint to improvements in supply chain performance in South Africa.

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265   According to Health and Primary Education, but also Higher Education and Training as well as Labour Market Efficiency of the Global Competitiveness Report

This goes in line with the evidence from cross-country benchmarks.[266] [267]

Although it is reasonable that the population wants to participate in the economic wealth of the country, the measures that the government takes to achieve that participation are, however, inappropriate. There is a risk that the government even intensifies the equity affirmative action measures. This would place an excessive burden on companies in South Africa, especially on small companies. The design of the affirmative action programme could sustainably impede local foreign investment and, thus, be counterproductive to the development of the supply chain system of South Africa. The costs of affirmative action measures need to be considered as costs of doing business in South Africa. The unreasonable disadvantages that the affirmative action programme places on established companies need to be eliminated.

Due to the low credit rating and looming downgrading of public enterprises and the state, funding of new investments of state-owned enterprises and businesses would become more difficult. Because of the high involvement of the public sector in supply chains in South Africa, the scarcity of funds as well as looming downgrading are expected to impede future improvements in supply chain performance in South Africa. Unless there is any private participation, the future development completely hinges on public funding.

The government unilaterally terminated agreements on the protection of investors with a number of countries.[268]

The current strained relations between the public sector, private sector as well as labour and labour unions and the lack of stability in the political and economic situation create an unfavourable environment for companies to operate and invest.

There is a lack of confidence in the economic policy of the government. The government does not provide the necessary stability and, thereby, creates an uncertain environment. Because of the uncertain business environment, instead of investing in

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266   According to Labour Market Efficiency of the Global Competitiveness Report

267   A country may find itself in a middle-income trap, i.e. a country is neither able to successfully compete on labour costs nor is it able to successfully compete on technology. In the case of Malaysia, improvements in secondary education have not yielded the necessary foundation to become an innovation-driven economy (UNDP 2013a: 76).

268   bilateral investment treaties; cf. DTI 2012

South Africa and putting their funds at risk, companies rather invest abroad and import. The uncertain business environment is regarded as a major reason for the low value of the local currency and, thus, for the high costs of import goods and services.

(5) Because of the potential short, medium and long-term effects on the location competitiveness, the insufficient political and economic stability represents a fifth major constraint to improvements in supply chain performance.

This goes in line with the evidence from cross-country benchmarks.[269] [270]

7.3.2 Actions for Improvement, Responsibilities and Obstacles

The country needs to maintain and strengthen its relative supply chain performance and importance in southern Africa in order to stay competitive. In this regard, there are arguments that, first of all, the country needs to decide whether it wants to position itself as equal or superior to other countries in southern Africa along the supply chain.

Because of the large geographical size, the variety of supporting factors to run manufacturing locations are most likely to be made adequately available in economic agglomerations or clusters. Future economic centres should be located at the coast. There is a need to set up agglomerations that comprise company locations, communications and transport infrastructure, educational entities, residential districts, public passenger transport as well as shopping facilities. The public sector is responsible for initiating actions and bringing the private sector in to set up and run businesses.

Ongoing investments in port infrastructure and operations need to be continued in order to increase port capacity, especially at the port of Durban. Productivity should be increased and port charges reduced in order to increase and maintain port performance. Because of the public ownership and operation, improvements in port performance are the responsibility of the Department of Trade and Industry. On the one

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269   According to Political Stability and Absence of Violence / Terrorism of the Worldwide Governance Indicators; Government Effectiveness and Control of Corruption of the Worldwide Governance Indicators is much lower for South Africa than for OECD countries; over the last two decades, both indicators for South Africa have declined.

270   The authors of the Economic Development in Africa Report 2011 state a lack of political stablility often results into higher costs of doing business. Domestic and foreign investors are unlikely to invest in an economic if the political stability does not meet the expectations. The political environment is a necessary condition for investment (UNIDO & UNCTAD 2011: 31).

hand, there are arguments that it is particularly the exclusive public ownership and operation that explains deficiencies in port performance. There is a lack of competiton in port business in South Africa. Private sector participation would lead to improvements in port performance. Terminals and ports in other countries in southern Africa, such as in Angola and Mozambique, as well as on the African continent, such as at the port of Abidjan on the Ivory Coast, are successfully run under public-private partnership. On the other hand, there is a fear that private participation would lead to an insufficient investment in ports as well as to a siphoning off of profits. It is pointed out that the government of South Africa will not allow other countries to take control of critical infrastructure and expose the country to such a high risk, as other countries on the African continent do. There are arguments that the public port company and government are keen on improving port performance. The speed of implementation is, however, low. The scarcity of public funds does not allow adequate investments.

To keep the state of road infrastructure, law enforcement with regard to load limitation, vehicle conditions, driver licences and driving behaviour need to improve. Weighbridges should operate permanently. Education and training of traffic inspectors needs to be improved. Corruption of traffic inspectors needs to be reduced. The road transport industry as well as the government of Australia have successfully implemented self-regulatory load measures – that is a good example to adopt in South Africa. The Department of Transport is responsible for improving the public part of the transport system. In order to limit and reduce the load on road infrastructure, both in domestic and cross-border transport, the rail transport system and performance need to improve.

Rail transport

Because of the high transport distances, many types of freight still lend themselves to rail transport. The situation of being caught between minimum and maximum distances represents an obstacle to the adequate use of rail transport in South Africa. Other interviewees plead, however, that in other countries, examples of well-performing rail transport systems, even at lower distances, exist. Hence, it should be possible to make rail transport keep up with other transport modes in South Africa.

Rail transport needs to redefine its role in the supply chain. Because of higher requirements on freight transport performance today, a certain share of freight will not go

back from road to rail transport anymore. Road and rail transport should not be regarded as competing modes of transport, but rather as complementary modes of transport on long-distance, intermodal and especially cross-border transport. There is a need for intermodal transport, for instance with a higher share of rail transport between seaports and freight stations. Rail should become more important in the transport of bulk freight but also in the transport of containerised freight and finished vehicles on domestic as well as cross-border transport. On distances higher than 600 kilometres, rail transport should become the preferred mode of transport. However, this requires that rail transport performance meets the customer expectations.

Despite major public and private stakeholders set up an initiative to and the government plans to shift rail-friendly freight back to rail transport, there are arguments that the current domestic and cross-border rail transport system does not have the necessary capacity to allow such a shift. Additional investments in rail infrastructure as well as rolling stock are necessary to improve rail transport performance. The first new locomotives were delivered in 2015 and more are still to come within the next years. There is a need for more intermodal transhipment centres as well as higher capacity of existing ones. The rail transport company is investing in rail infrastructure and equipment and rail transport performance is improving; however, not as much as it was supposed to be. There is a need for organisational improvements in rail transport. Planning and coordination among port operators, shippers, transport operators as well as the rail transport company and compliance with schedules by both the transport company as well as shippers needs to improve. Currently, the rail transport company is establishing coordination centres. The implementation is, however, still at an early stage and customers are not involved yet. There is a need for more reliable rail transport services. Variance in transport time needs to be reduced. There is a need for improved planning procedures. Planning procedures need to be able to quickly restore scheduling in the case of unexpected events. There is a need for a higher visibility of freight and rolling stock during rail transport. A major area for improvement will be digitisation of the rail transport system. The current rail transport strategy is currently complemented by plans to increase digitisation of the rail transport system. Improvements in cross-border rail transport would require a high degree of harmonisation in terms of infrastructure, equipment, operations and public policies among countries. Because of the necessary investments and improvements, it will take at least ten years to shift significant volumes back to rail.

Despite deficiencies in rail transport performance, a lack of rail hinterland transport performance is also attributed to deficiencies in performance at the port of Durban.

Because of the public ownership and operation of the rail transport system, the public rail transport company is responsible for improvements. There are a number of ownership, management and operating options to improve the rail transport performance. First, the rail transport company should be split up into its divisions and the rail freight division should be privatised. Second, the rail transport system should be operated by both the public and private sector. Whilst the public sector should operate the infrastructure, the private sector should run the operations. Third, the private sector should get involved in the first and last mile, transhipment centres and operation of branch lines. A meaningful private sector participation also seems to be impeded by the view that the public sector is responsible for preserving employment opportunities by means of rail transport.[271]

It is difficult to find good examples in the supply chain sector on the African continent that South Africa could look at and learn from. Good examples can rather be found in Europe. Rail transport works well in Germany, for instance rail transport of finished vehicles from inland manufacturing locations to seaports.

Border crossings

The efficiency of border post operations needs to be improved. Corruption needs to be reduced. The costs of crossing borders need to be reduced. One-stop border posts along with accelerated border control for pre-cleared goods would reduce these deficiencies. To get a one-stop border post running, legislation, infrastructure, the necessary capacity in public services with regard to customs, health, immigration and security needs to be provided. Whilst governments should provide the legislation, the private sector should get involved in the provision of infrastructure as well as execution of border compliance controls.

By providing the necessary legislation, the government should facilitate trade. A border management agency exists in South Africa; however, their focus is on ensuring security in cross-border trade instead of facilitating cross-border trade.

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271   It is interesting to note here that there is evidence that such as view is expected of the public rail transport system in Namibia as well.

Plans for one-stop border posts have existed for many years, it is only now that governments are taking actions. The responsibility to implement one-stop border posts lies with the participating governments and public authorities. The one-stop border post at Chirundu between Zambia and Zimbabwe indicates that one-stop border posts can work in southern Africa. However, plans to set up one-stop border posts in southern Africa have existed for twenty years. There are two major obstacles to the implementation of one-stop border posts. First, traditional border posts provide opportunities for corruption and one-stop border posts would reduce or eliminate these opportunities. This causes resistance. Second, the lack of funding and willingness impedes their set up and implementation. Because neighbouring countries, such as Mozambique, are reliant on income from trade, from their point of view border controls are necessary.

Education and workforce

Education and training needs to improve. On the one hand, there are arguments that the quality of education entities and teachers needs to improve. On the other hand, there are arguments that the necessary education entities exist in South Africa and – again – it is the inability of people to pay tuition fees that keeps them from making use of it.

To reduce the skills gap, all people need education from an early age. All stakeholders, i.e. individuals, companies, business associations, education entities as well as the government, are responsible for providing people with the necessary basic and professional education. It will take many years to eliminate this skills shortage.

There are arguments that a vocational education in South Africa does not exist; this could indicate that there is a need for a vocational education.

Labour market policies

The frequency and duration of labour strikes needs to be reduced. The labour costs need to be reduced in order to improve port performance and manufacturing location performance. Relaxed labour laws would make it easier for employers to hire and – if employees do not meet the requirements – to dismiss employees.

The interplay between public policies, labour and labour unions contributes to the good economic performance in other countries, such as Germany – that is a good example for South Africa to look at and learn from.

There is a need for more bilateral agreements, between employers and employees.

Political and economic stability

Higher economic growth along with fiscal prudence are recommended to enable adequate investments in supply chain systems. In addition to the tight financial situation, investments in the supply chain system may also be impeded by a rivalry of funds for economic and economic development objectives. Since the end of the apartheid, the country has not achieved the envisioned economic development objectives. The government needs to strike a balance between adequate spending on social issues on the one hand and economic issues on the other hand.

There is a need for elimination of unreasonable disadvantages that the affirmative action programme places on established companies.

The government needs to stabilise the political and economic situation in order to contribute to an appreciation of the local currency.

There is a need for a resolute leadership to reclaim political, economic and social stability.

Public service performance – at local government level – needs to be improved. These services include roads, water, sanitation, electricity, law enforcement, prevention of crime and prosecution of traffic offences as well as invoicing for such services.

8   Overall Considerations and Conclusions

This research project evolved from the finding that supply chain performance is very different from country to country in southern Africa. Whilst a number of countries show a low supply chain performance, other countries show a medium and only few countries a high supply chain performance. The majority of countries fall well short of their supply chain performance potential. An adequate supply chain performance is, however, necessary for countries to further integrate into contemporary fragmented and international value networks and, thereby, allow for further economic development. In chapter one, this finding brought us to the question of this research "What constrains southern African countries from further improving their supply chain performance?"

A Look Back at The Course and its Results

Before drawing conclusions regarding the three selected countries, setting the wider scope of application and specifying aspects that deserve further research, it first seems worthwhile to look back at the course of this research project and its results.

Chapter one started by describing the research problem, stating the aim of this work and defining the research objectives and questions. Chapter one provided an outline of the research approach and research design as well as of the limitations of this work. A comprehensive elaboration of the research approach, design and pertaining methods as well as the limitations of this research were to follow in chapters three and four.

Chapter two set the framework in which this work is placed. First, it established the terminology on logistics and supply chain performance as well as, second, on economic growth and economic development. Third, chapter two identified the causal link between logistics and supply chain performance, on the one hand, and economic growth and development, on the other. Four major causal mechanisms through which supply chain performance can contribute to economic development were identified, namely, (i) exchange of goods, (ii) exchange of knowledge, (iii) local value-add and integration into value networks as well as (iv) external economies and economic agglomeration. Notwithstanding, chapter two emphasised two critical aspects: Whether higher supply chain performance and economic growth actually translate into economic development rests upon the design of local supply chains and on a set of formal and informal institutions. Fourth, chapter two reviewed five major cross-country benchmarking series that were expected to provide information on the state of supply

chain performance of countries. These included World Bank "Connecting to Compete", World Bank "Doing Business", Center for International Development at Harvard University "The Atlas of Economic Complexity", the World Economic Forum "Global Competitiveness Report" as well as the World Bank "Worldwide Governance Indicators". Although these benchmarking series were not able to provide an answer to the central research question, they provided starting and reference points for the research design, case selection and diagnostics. By doing so, chapter two provided answers to the research questions on how supply chain performance can be defined at a country level and how supply chain performance can be measured at a country level.

Chapter three developed a research approach and design in order to identify constraints of supply chain performance as well as to identify actions for improvement, responsibilities and obstacles thereof. A case study research design formed the basis. A most-similar case selection approach seemed promising. The basic assumption was that the selected cases, i.e. countries, have a number of characteristics in common, but have achieved three different levels of supply chain performance. Depending on the level of supply chain performance, different constraints were expected to prevail in each country. The procedure made allowance to a wide range of factors, covering economic, political, cultural, technical as well as organisational factors. The case study research followed a growth diagnostics approach (cf. Hausmann & Rodrik & Velasco 2008). A quantitative method, i.e. an online questionnaire, and a qualitative method, i.e. qualitative expert interviews, were used to collect the information. These two sources were expected, on the one hand, to provide a sufficient degree of detail and, on the other, to consider the big picture. These two major sources of information have been combined in a convergent parallel mixed methods research design.

Chapter four reduced the initial geographical scope from 12 mainland SADC countries to three coastal countries, namely, Angola, Namibia and South Africa. Despite differences, these countries show a low level of economic development in the wide population. Of central importance to the case selection process is that these three countries have a number of common characteristics but differ in their level of supply chain performance. Common characteristics include their coastal access, large geographic area, low average population densities, mineral resource production and export intensity, despite different trajectories their colonial past, shared membership in the same regional economic community and their scarcity of year-round navigable waterways.

Chapter five explored major country characteristics in more detail. First, it analysed economic, socio-economic and geographic factors that are expected to affect supply chain performance. Second, it analysed and continued to analyse the data of the cross-country benchmarking series on logistics, production and export performance.

Chapter six turned to the collected data. First, it presented the procedure to select the interviewees and respondents as well as the sample characteristics. Second, it analysed the parameters that interviewees take into account when making their decision on the choice of seaports, road transport networks, rail transport networks and manufacturing locations. These parameters were compared to the compiled attribute structure of the questionnaire in order to assess its level of compatibility. It turned out that in the case of seaports and manufacturing locations, there is a high degree of consistency. In the case of road and rail transport, respondents focussed on the modal choice; on the basis of the given information, it could only be assumed that there is a high level of compatibility. Third, chapter six put the two sources of expert information together and, thereby, obtained a comprehensive and coherent picture of weaknesses of supply chains as well as of areas, actions, responsibilities and obstacles to improvements of suppy chain performance in Angola, Namibia and South Africa. Chapter six concluded with a review of the data collection, database and analysis. Whilst the number of questionnaire responses does not meet the expectations and clearly sets limits to the analysis, the number of qualitative interviews is entirely satisfactory. Below the line, the data collection provided a comprehensive base of information. Important to stress again at this final stage is that the review concluded with the view that the researcher reached the limitation of what is feasible under the prevailing circumstances and within the organisational framework of this research.

The preceding chapters laid the foundation for what was to come in chapter seven – the diagnostics of binding constraints of further improvements in supply chain performance in Angola, Namibia and South Africa. First, chapter seven identified factors that represent constraints of further improvements of supply chain performance. Second, based thereon, it identified actions that are expected to lead directly to improvements as well as factors that are expected to provoke actions for improvement by other stakeholders. In addition, chapter seven set out responsibilities and potential obstacles to the realisation of improvements. It yielded the following major results:

In Angola, a (1) lack of public and private funds and foreign exchange, (2) deficiencies in the import-oriented transport system, (3) deficiencies in the domestic transport system, (4) deficiencies in supply of electricity as well as (5) deficiencies in education and workforce mainly constrain supply chain performance. The country still needs to achieve an adequate import-oriented and domestic transport system as well as general economic infrastructure, before the country can establish a market-oriented agricultural and industrial production industry and, thereby, diversify its economy.

In Namibia, the (1) small market size, (2) deficiencies in the rail transport system, (3) deficiencies in education and workforce, (4) deficiencies in water supply, (5) deficiencies in electricity supply as well as (6) deficiencies in investment policies mainly constrain supply chain performance. The country needs to maintain and strengthen its domestic and cross-border transit transport system and attract production companies in order to attract higher volumes.

In South Africa, the (1) insufficient rail transport performance, (2) deficiencies in border crossings, (3) deficiencies in education and workforce, (4) deficiencies in public labour market policies as well as the (5) insufficient political and economic stability mainly constrain supply chain performance. The country needs to maintain and strengthen its relative supply chain performance and importance in southern Africa in order to stay competitive.

Whilst Angola is mainly but not exclusively constrained by basic factors, Namibia and especially South Africa are mainly constrained by advanced determinants of supply chain performance. Angola is facing constraints that Namibia and especially South Africa overcame a long time ago. Hence, the starting hypothesis that the countries are at three different levels of supply chain performance was confirmed by this research.[272] Because of their differences in economic development and supply chain performance, it was stated that in a number of factors Angola should look at and learn from Namibia and South Africa. Due to the lower volumes, in terms of adopting new technologies, Namibia will always be a bit behind South Africa. Nonetheless, Namibia should look at, learn from as well as follow good examples of South Africa. Although

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272   Relevant to note here is that Memedovic et al. (2008: 359) point out that basic factors, such as the provision of infrastructure, are often mainly an issue of investment and technical know-how, whilst advanced factors, such as regulation on trade and transport, often involve the coordination of multiple national interests. That is, the higher complexity of advanced factors makes it more difficult for countries to climb up the supply chain performance level. As countries climb up the level of supply chain performance, they are likely to be confronted with more challenging problems.

a few good examples that South Africa should look at and learn from exist on the African continent, most examples for South Africa can be found on other continents.

The Wider Scope of Application

This case study research revealed a number of issues, which are, in the first instance, relevant to the three selected countries and to the southern African region, but may also be of value to other countries and regions.

First, as the cases of Angola, Namibia and South Africa revealed, historical trajectories coined the design of supply chain systems of countries; despite transformation over time, past designs of supply chain systems still partly explain their design today. On the one hand, past designs may be conducive to supply chain performance today; on the other hand, past designs still explain weaknesses and even major constraints. Because supply chain systems in many countries on the African continent were designed to supply their colonial masters with resources and prevented a development towards self-sufficient economies, this may apply to other countries as well.

Second, as the case of Angola shows, conflict or war kept and still keeps a number of countries from advancing and even maintaining their stage of supply chain performance and economic development – while other countries have the chance to move forward. These countries did not only suffer from the devastating war, but also from the negligence of developing a sustainable self-supporting structure of the economy. Because of a lack of various basic factors, these countries first need to provide basic factors of supply chains, before more advanced objectives can be achieved. As the case of Angola has shown, deficiencies in physical infrastructure are most evident; nonetheless, deficiencies equally exist in non-physical infrastructure, such as the formal and informal institutions. Although the war ended more than 16 years ago, informal procedures that emerged and have been established during the war, still exist today. Education and training is another area, which often did not receive adequate attention.

Third, as the cases of Angola, Namibia and South Africa revealed, albeit at different levels, rail transport performance is insufficient in all three countries. Either rail transport services are not available, service levels and / or costs are not competitive or service levels and / or costs do not even meet the permitted service levels or costs. This prevents regional integration of rail transport on the southern African continent. Add to that the differences in infrastructure and equipment among countries. Although

over the last decades, requirements to transport characteristics have changed and for many business cases rail transport does not represent the preferred modal option anymore, rail transport still has an important role to play in today's supply chains, especially in long distance multimodal hinterland and cross-border transport. Insufficient rail transport performance implies that much increase in freight volumes have to be absorbed by road transport. This, in turn, increases the load on road infrastructure. Insufficient rail transport performance does not only seem to apply to and constrain domestic and cross-border transport as well as supply chain performance in the selected countries, but in many countries on the African continent as well. Important to note here is that a redevelopment of rail transport systems not only entails the reconstruction and development of infrastructure but also the recovery and development of well-performing operations.

Fourth, illegal circumvention of road transport regulations is an issue in all three countries. The fierce competition in the road transport industry along with insufficient law enforcement, or even insufficient legislation, incentivises circumvention of public regulation. Illegal circumvention of transport regulation impedes a sustainable development of the transport sector and, thus, sustainable development of supply chain performance. There is evidence that illegal circumvention of road transport regulation is an issue in other countries on the African continent as well.

Fifth, as chapter two and the cases of Angola, Namibia and South Africa showed, constituent parts of supply chains are often seen by policy makers as a means to achieve national economic development objectives. In Namibia and South Africa because of the high involvement of the public sector in supply chains, such as ports and rail transport systems, and general infrastructure, such as electricity and water supply, the responsibility is often seen to lie with the public sector. Moreover, in both countries there is a high degree of public intervention in private sector business. In both countries, the public sector feels responsible for alleviating past disparities, through both an active stakeholder in supply chain operations as well as public regulation. Nonetheless, there are disputes about the appropriate role as well as degree of involvement and intervention of the public sector in supply chains. In Angola, the role of the public sector as an active stakeholder in supply chain operations is lower than in Namibia and South Africa. Yet, there is, on the one hand, a considerable degree of public intervention and, on the other hand, there are shortfalls in the necessary public regulation of the private sector. Albeit under different cirumstances, due to shortfalls in economic development, this predicament may apply to other countries as well.

Sixth, as the cases of Namibia and South Africa but also, since the economic recession, of Angola show, the scarcity of funds brings a rivalry of funds between, on the one hand, socio-economic factors, such as general infrastructure, and, on the other hand, supply chain factors. Because of shortfalls in economic development, these governments need to stike a balance between spending on and developing social and economic areas. This is important to stress at this point not only because economic development should be regarded as the primary objective of countries but also because the level of economic development cuts through to the level of supply chain performance of a country. This may apply to other countries at a low level of economic development with considerable challenges in supply chain performance as well.

Seventh, as the core and peripheral cases have shown, economic integration is still far below its potential and all three countries could benefit from a higher degree of economic integration. However, a number of factors still impede a higher economic integration and, thus, further development of regional supply chain system in southern Africa. To begin with, revenues from trade still represent an important source of public income to some countries. A free trade area still does not exist in southern Africa. As a consequence, border controls require transport to stop at borders. Although an abolishment of border posts may, at this point in time, not be appropriate, there is much to be gained from improvements in infrastructure, operations, legislation and law enforcement at border posts. Moreover, differences in legislation and standardisation across countries require additional border compliance procedures. Harmonisation of standards is still at the beginning in southern Africa. For instance, customs documents, gross vehicle weight limitations as well as technical quality requirements of vehicles should be harmonised across countries. Different gauge sizes and traction modes of rail transport require equipment and crew changes and impede cross-border rail transport. Finally, interviewees stated that there are talks on an introduction of a single currency in the SADC. However, it must be taken into account that these countries are even more diverse than countries of the euro zone. For this reason, a single currency in the SADC does not seem to have much prospect of success.

Finally, as the cases of Namibia and South Africa revealed, in cross-border transport, a number of different stakeholders, i.e. people and organisations from different countries, different cultural backgrounds as well as educational backgrounds encounter. Their differences make these people to behave differently. Due to the need for shared standards in supply chains, their differences may induce clashes. These issues are, at least in the short-term, outside an individual's, organisation's and country's control

and may have an impeding effect on cross-country supply chain performance. As the case of Angola reveals, these behavioural factors of supply chain performance were established successively over time and cannot be changed overnight; decisive and long-term actions seem to be necessary to provoke improvements. Thus, improvements in supply chain performance in one country are not exclusively an endogenous but also an exogenous matter. That is to say, that improvements in supply chain performance in one country also require improvements in other countries.

Further Research

It is hoped that this work contributes to the ongoing research on constraints of supply chain performance in the three selected countries but also with regard to other countries and regions. This research should receive further attention in three main aspects.

First, this research has identified binding constraints of supply chain performance and pointed to recommended actions for improvement as well as responsibilities and obstacles at a country level. Still, constraints and actions, responsibilities and obstacles may vary from region to region within a country. To embrace a finer level, more local and specialised knowledge and input is necessary to make further investigations.

Second, the database as well as conclusions refer to the time of data collection and analysis. Factors that represented constraints in the past may not represent constraints in the future anymore. It may just as well be that actions for improvement are not appropriate to alleviate constraints in the future any more. That is to say, that the results of this applied research present no more and no less than a snapshot and require follow up research.

Third, whilst the methodology turned out to be an improvement compared to methodological approaches, which only focus on performance values, the measurement of importance values and the combination of importance and performance values also raises issues. Even though the number of questionnaire responses did not meet expectations, the methodological procedure and result has been set out and illustrated. Based on the remarks on the methodological and procedural limitations, further research could be done to improve and apply the methodological instrument. Worthy to repeat is that experts regarded the personal interviews as a valuable but still underrepresented approach in research on logistics and supply chains in southern Africa.

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List of Acronyms and Abbreviations

ACA	Adaptive Conjoint Analysis
AO	Angola
AOA	Angolan Kwanza
CBCA	Choice-based Conjoint Analysis
COI	Complexity Outlook Index
Dft	Distance to frontier
DR Congo	Democratic Republic of the Congo
ECI	Economic Complexity Index
Est.	estimated
EU	European Union
FDI	Foreign Direct Investment
GCI	Global Competitiveness Index
GDI	Gross Domestic Income
GDP	Gross Domestic Product
GNI	Gross National Income
HDI	Human Development Index
HS	Harmonized System
IDI	Inclusive Development Index
km	kilometres
LPI	Logistics Performance Index
MVA	Manufacturing Value Added
NA	Namibia
NAD	Namibian Dollar
OECD	Organisation for Economic Co-operation and Development
OSBP	One-Stop Border Post
PC	Per Capita
PPP	Purchasing Power Parity
RCA	Revealed Comparative Advantage
SADC	Southern African Development Community
SC	Supply Chain
SITC	Standardized International Trade Classification
TCA	Traditional Conjoint Analysis
USD	US-Dollar
WBCG	Walvis Bay Corridor Group
ZA	South Africa
ZAR	South African Rand

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Declaration (Erklärung)

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